THE JOURNAL OF GAS LIGHTING
WATER SUPPLY & SANITARY IMPROVEMENT

VOL. CXII. No. 2475.] LONDON, OCTOBER 18, 1910. [62ND YEAR. PRICE 6d.

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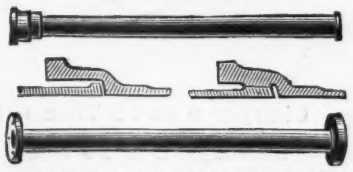

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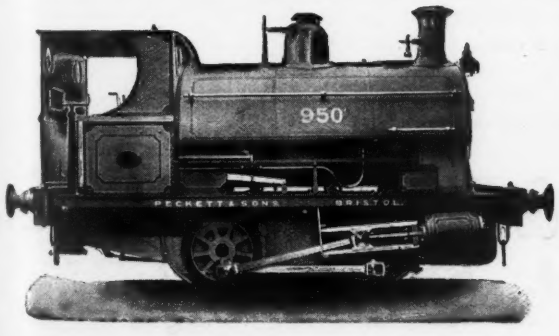

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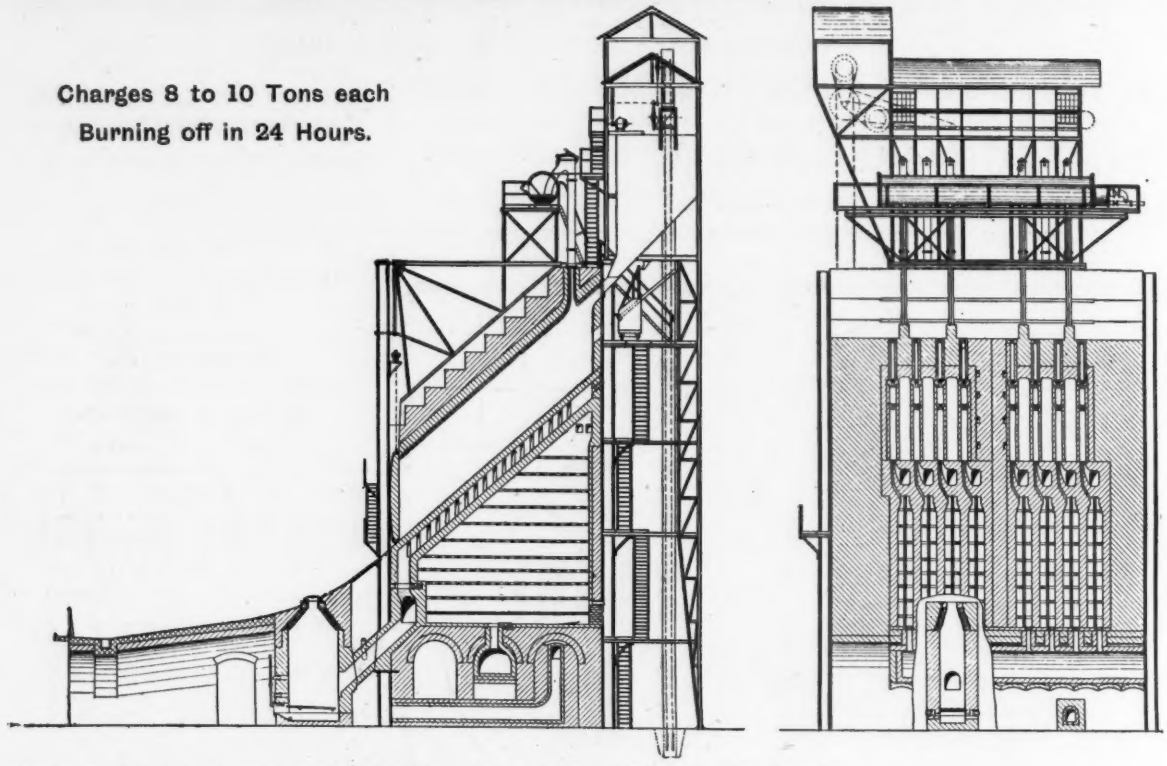

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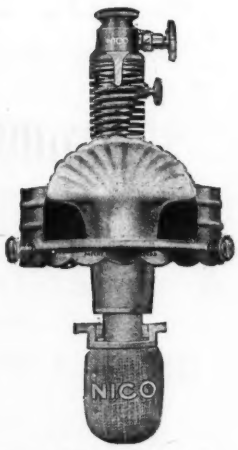

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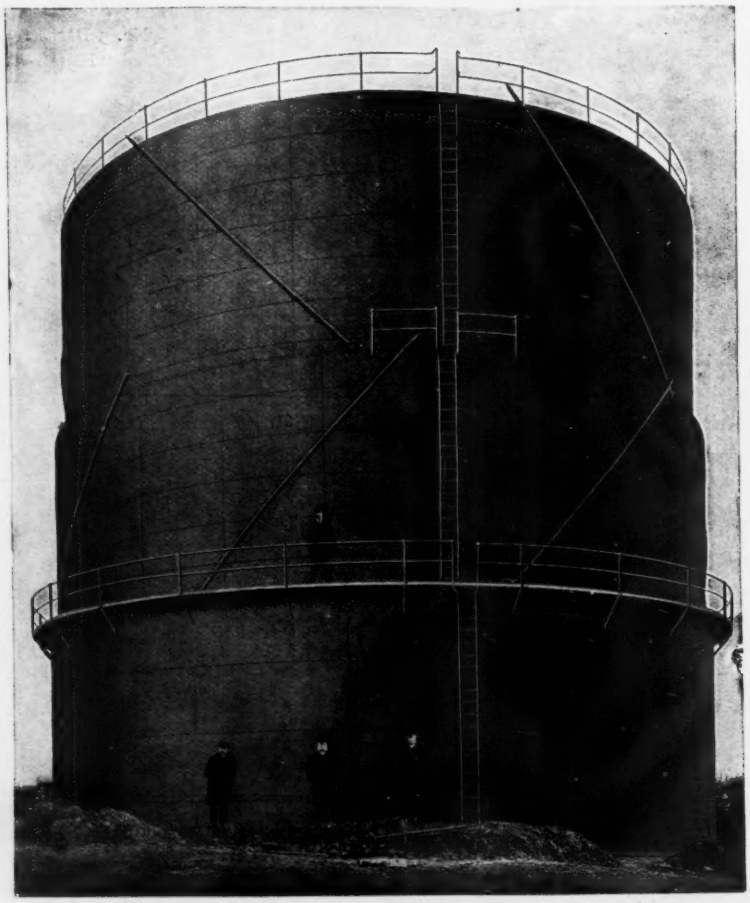

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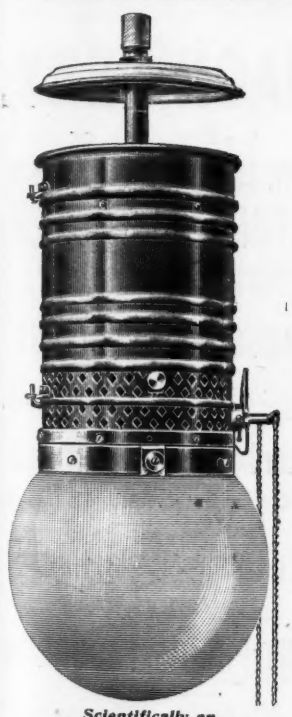

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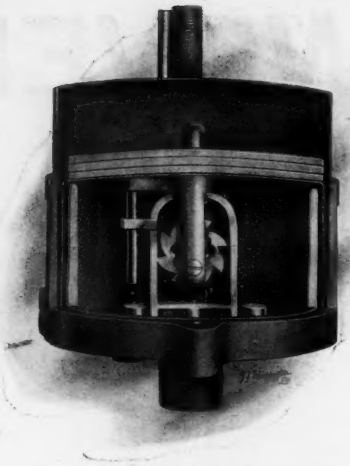

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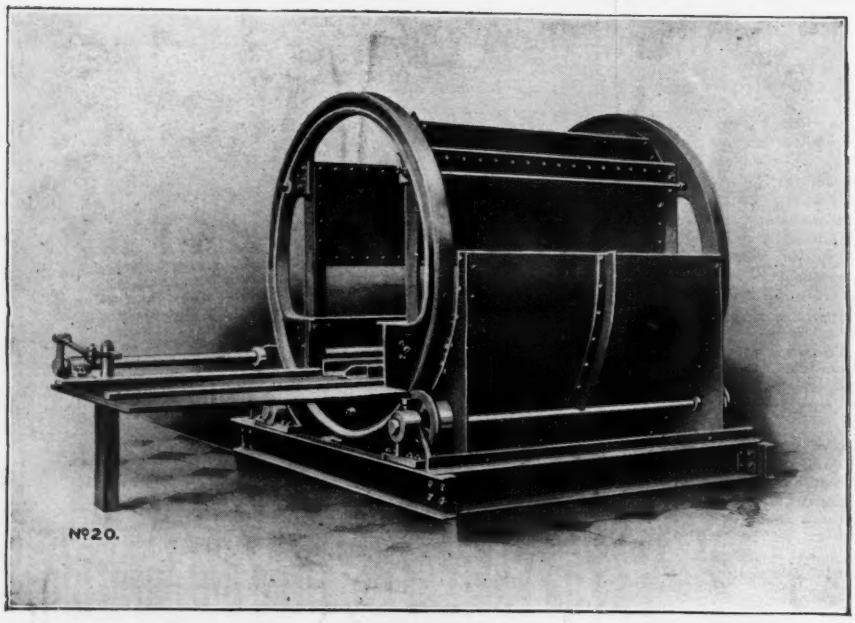

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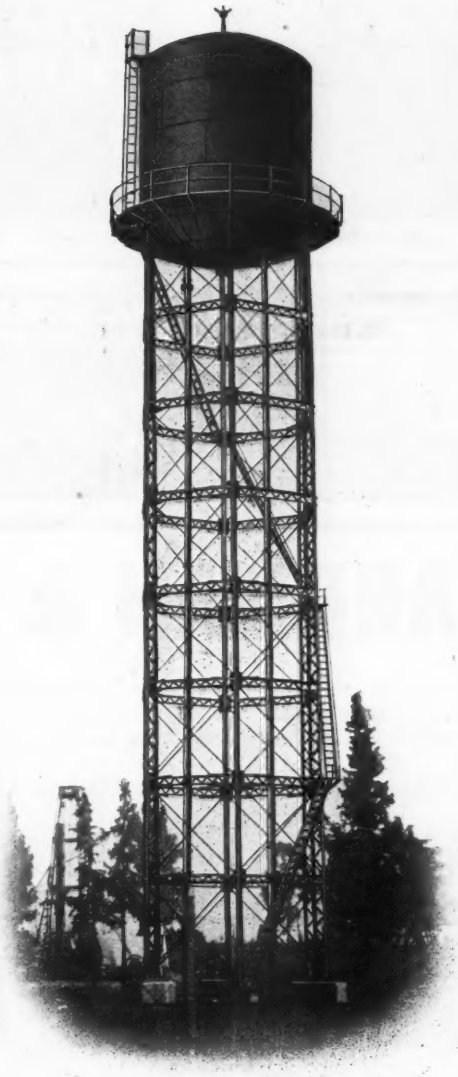

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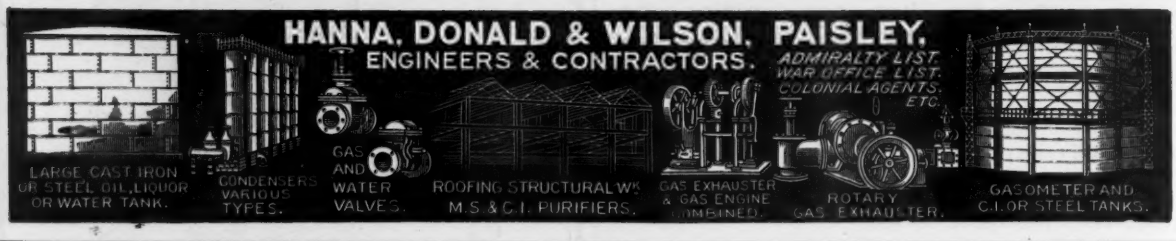
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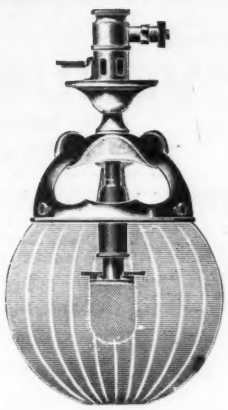

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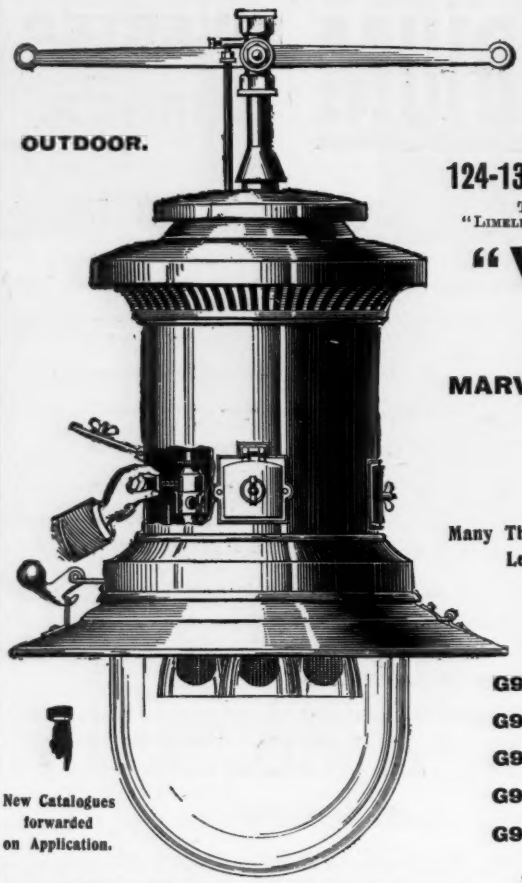

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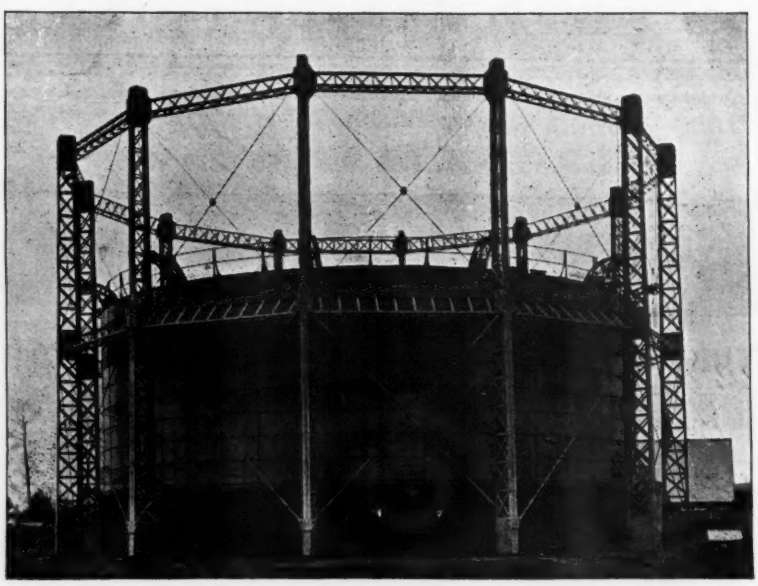

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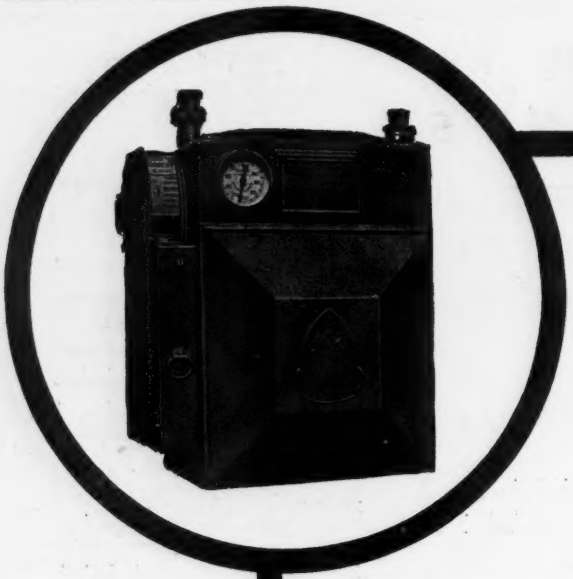

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EDITORIAL NOTES—GAS, &c.

Gas Publicity.

OUR electrical friends do not appreciate the adoption by the gas industry of their own methods in the matter of the systematic advertising of electricity. They were not, however, the first in the advertising field. Gas undertakings were making announcements direct to the public, through the aid of the daily and weekly newspapers and weekly and monthly magazines, long before the Electricity Publicity Committee was conceived. But where electricity has led has been in the collective support of electricity supply undertakings to this means of bringing the virtues—more or less correctly described—of their commodity before the public. Collective support for gas publicity, as was seen in our issue for Sept. 27 (p. 825), is now being organized; but meanwhile private gas undertakings are advertising on a larger scale than ever. This fact, however, must not have any adverse influence on collective effort in this direction. There is in the gas industry too much of the tendency to let others do all the pioneering and other work; too much of the mean spirit that holds in allowing other people to do all the voluntary pulling of the chestnuts out of the fire, and then participating in the feed. There are gas company administrators who, within our own knowledge, will not agree to expend the amount of the subscription to the Gas Companies' Protection Association or to the Sulphate of Ammonia Committee, on the ground that, while other people are willing to spend the money to keep matters active in the fields of the operations of these organizations, there is no call upon them to lay out money in any such way. It would be a bad thing for the gas industry if all gas administrators were actuated by like miserable shortsightedness and parsimony. Men of those characteristics, men with minds so concentrated that they cannot appreciate the needs of the times, are unworthy their positions in a progressive industry. However, we hope to see a united gas industry in this matter of the general advertising of the merits of gas; and the sooner now the Committee who have the formulation of the joint advertising scheme make a pronounced move, the better. Opportunity is being allowed to slip past. The lighting and heating season is upon us; and there ought already to have been seen such an advertising of the inverted gas-burner and gas-fires as has never been witnessed before.

Meanwhile, certain gas companies are pursuing an independent advertising campaign. Advertisements have appeared in certain London newspapers, in the Woman's Supplement of "The Times," and in provincial papers. The Gaslight and Coke Company have spent generously in this direction; and the South Metropolitan Company have done a part. Various provincial companies are engaging in local advertising with greater enthusiasm than was at one time the case. An excellent example is seen in an advertisement occupying nearly half a page in the "Reading Standard;" this being inserted by the local Gas Company. It is headed "Facts! not Fiction;" and in it there is worked out a comparison of the cost of the electricity consumption of a 50-candle metallic filament lamp at 6d. per unit, as compared with the gas consumption of a 60-candle power inverted incandescent burner, with gas at 2s. 6d. per 1000 cubic feet. Per 1000 hours, the cost of current is £1 11s. 3d., as against 7s. 6d. for gas. The Reading Electric Supply Company have a similar advertisement; but, duly cautious, they do not commit themselves to comparative figures, being content with a few generalizations. But local and spasmodic advertising is not sufficient for the gas industry. Something more is required to-day. It is requisite that we should keep pace with, and even ahead of, the electricity industry in this matter of publicity. The gas industry has, since electricity came into the field for lighting, heating, and cooking, always led in the magnitude of business in those branches; and the lead can easily be maintained by a liberal recognition of the nature of the activity with which we have to contend. It is always wise to give one's competitor the credit of possessing greater strength than is actually the case.

Electricity Evicted by the Society of Medical Officers.

WHEN the Society of Medical Officers have decided to evict electricity from the meeting and exhibition rooms on their premises, it may be taken that they have some good and sufficient reason for doing so. For some years, they have tried electric lighting (this having superseded the old method of gas illumination), even to the metallic filament lamp; and they have found it sadly wanting. This fact, and the one that the Committee and members of the Society are all members of the medical profession, may be counted by the gas industry as of importance, which is accentuated by the further facts that the modern system of inverted gas lighting has been adopted, and gas has also been chosen as the fuel for heating.

All too long, with hardly superficial consideration, many members of the medical profession favoured the use of electricity and the abandonment of gas; but when asked for reasons, it was invariably found that they had not got farther with the study of the matter than the elementary stage that in the combustion of all gases there must be products of combustion, while with electric incandescent lamps there are none. Beyond that point, few ever ventured. Those who did found that with gas, the products were harmless, and that the use of gas assisted in producing the circulation of the air of rooms; while, on the other hand, where electric light was employed, and a number of people were gathered together, the lamps did not assist in the circulation of the air, that there was stagnation, and, consequently, in a short time, the exhalations of respiration charging the air caused it to be unwholesome for those who had occasion to remain in such an atmosphere. That is just what the Committee of the Society of Medical Officers of Health have found; and they have further found that the light distribution of electric lamps is not at all satisfactory. And these two findings have induced them—it is not a matter of economy with them, so much as a sanitary atmosphere, and a good light—to return to gas. This will be a sad blow for the electricians, who, beaten on the score of economy, have made much in the pursuit of new custom of the old "baseless fabric" of the "vision" of our medical friends.

Here, however, the return to gas on the premises of the Society of Medical Officers of Health is made on the strength of an experience with electricity extending over some years, and of considerations as to the relative effects of the two forms of lighting to which attention had not been formerly given. Not only in respect of lighting, but of heating, gas is the elected fuel; and the system by which it is applied supplies the greater part of the interesting subject-matter of an article elsewhere. The position and influence of the members of the Society make their example all the more valuable. Example—satisfaction is already expressed with the experience—such as this goes a very long way; just as the Gaslight and Coke Company have found that a properly fixed gas-fire in a medical practitioner's house has a remarkably rapid effect in removing misconception in that household, and in spreading the truth of the matter in relation to gas heating. Within their own knowledge, the Company can name something like 1000 medical men in their area of supply with gas-fires in regular use. And those who are not medical practitioners, but are interested in electricity, talk of rooms in which gas-fires are used as something akin to lethal chambers. It must be a strange case that is served better by ignorance and misrepresentation than by knowledge and truth.

Expansion of Work among the Juniors.

THE Junior Gas Associations have commenced their new session's work with an ardour that is eloquent testimony to unabated vigour. This is one of the most satisfactory signs of our times; for in it we have a clear endorsement of the guarantee that, with the exercise of a wise policy on the part of our gas administrators, the executive posts of the gas industry will still be filled with men well equipped for the conduct of business. The organization of the juniors, the enthusiasm displayed at their meetings, and the range of subjects dealt with in the Presidential Addresses and in the papers that are produced, are all the material presentments of an earnest desire to gain something, and that something is knowledge, and knowledge of a high-class order. The juniors of the day realize that knowledge makes the strong man in any walk of life; they realize that knowledge eases the labour of life whatever be the vocation; they realize that knowledge can command (through the better service that can be rendered) respect, and serve as the road to advancement; and they realize that knowledge will enable them to hold their positions the better in the keen struggle of life. The broader and the deeper the knowledge, too, the greater the personal enjoyment and recreation derived from its possession. It is recognized that the age does not become less competitive. Competition grows day by day. In it there is an unceasing restlessness; and the truth of this is found not only in industry and trade, but in the increasing activities for supremacy of the countless units that make the mass that we describe by the general term of mankind. When, therefore, our particular juniors put forward such a vast amount of voluntary effort in the acquisition of special knowledge to help to qualify them the better for the vocation of their choice, there is ground for satisfaction at the appreciation they thus evince regarding the needs of the times in respect both of personal efficiency and of industrial well-being.

The really efficient gas engineer of to-day has to be the possessor of knowledge that can be used in construction and direction which would qualify him for position in almost any branch of engineering; his commercial knowledge and instinct must be of a high order in connection with the purchase of materials; as a manager, he must have a broad knowledge of human nature, and be himself humane; and as a manager, too, on the competitive side of trading he must be keen and ever alert. The gas engineer of the day indeed requires to know many things; his work becomes daily more imperious in its demands and more crucial. Then all the more honour to those who take up the gas industry as the field for their professional life-work, and by their individual effort increase their personal accomplishments for the better negotiation of the task that lies before them. Already this session the range of subject-matter brought before the various Junior Gas Associations indicates the numerous lines in which knowledge has to be pursued. Look to the addresses of Mr. W. Dunlop, of Kirkcaldy, of Mr. J. Fraser, of Provan, and of Mr. R. S. Ramsden, of Burton-upon-Trent, to the lecture of Professor Cohen on "Smoke" last Saturday, and to the papers that have appeared in our columns on "Coal Tar Distillation" by Mr. A. R. Warnes, and by Mr. J. Berry on "Retort-House Governors," and there alone there is a variety of knowledge represented that might well make those who do not like work for its own sake stand aghast at the very idea of engaging themselves to a progressive industry demanding so much of those in the positions of technical and commercial responsibility. We do not want these in the gas industry; and the industry will be all the better for freedom from their attentions. And they may as well learn first as last that there is no industry to-day that requires greater application of science, nor demands more from its technical and commercial officers, than that of gas manufacture and supply. It will be an absolute waste of time for those to hope to retain position in the gas industry who think that a little labour expended in acquiring an amount of superficial knowledge will enable them to enjoy an age of ease.

It augurs well, then, that there should be this voluntary activity in acquiring knowledge on the part of those who have planted their feet in the gas industry. There are many of them who want to do more than is possible by internal means, and to take advantage, in addition to the teachings obtained from their own collective experience, of the instruction that is available, by proper arrangement, from scientific specialists and teachers. It is a desire that should be encouraged; and the seniors of the industry should see what can be done to assist in bringing to tangible form the aspirations and ambitions of the juniors in this respect. The Leeds University provides a special course of university training for those who are in a position to take advantage of it, and are making the gas industry the scene of their life's work. In connection with the University, too, special courses of lectures have been arranged for those who cannot avail themselves of the long course of systematic study (see *ante*, p. 49). These lectures will appeal more particularly to those who are within a reasonable railway journey to Leeds. On their own initiative, or on that of their President (Mr. F. Thorp), the Manchester Junior Gas Association, with the assistance of Dr. Harold B. Dixon, Professor of Chemistry at the University of Manchester, and of the Council of the Manchester District Institution of Gas Engineers, have succeeded in bringing about arrangements for courses of gas lectures in connection with the University.

The thing that we have admired even as much as the success that has all along attended their efforts has been the resolute manner in which the Junior Association "stuck to "their guns" until their object was attained. The syllabus (*ante*, p. 37) shows a course of lectures by masters in their subjects; and when it is observed that three of the lecturers are from London, the question naturally arises: Why cannot the other Junior Associations nearer south also secure the services of these gentlemen in similar manner? There are the Midland and the Southern Associations. What of these? Cannot the Senior Gas Associations do something to assist them in obtaining what the Manchester District Institution have realized? It is quite certain that, at such a distance from Leeds, a course of lectures of this kind could not possibly affect those at the industry's recognized centre at Leeds. The Welsh seniors are very anxious to assist the juniors in their area, who, through the scattered character of the gas undertakings in Wales, are not as yet organized. The seniors have experienced difficulty in formulating their plans; but they are getting to the point at which they will shortly be taking tentative action to test the workableness of their schemes. On every hand there are the indications of fervour among the juniors which deserves the fullest encouragement. We wish them the utmost success in their endeavours.

The Development of Scientific Illumination.

A HANDY little instrument, novel and ingenious in its design, for the measurement of surface brightness, has been introduced in a paper read, before the Optical Society, by the inventors, Mr. J. S. Dow and Mr. V. H. Mackinney. Full details concerning the device are given in other columns this week. There are unquestionably fields of utility and fields for interesting and practical research for such a portable instrument as this, if not used in any arbitrary manner. This is a development, on original lines, from illumination photometers, and in many respects for purposes for which they are not applicable; but in the use of the latter, under the diverse conditions of their employment, the results have been so eccentric and disuniform, although the photometrical values of the sources of light may have been approximately the same, that one has become distrustful of them. This instrument of Messrs. Dow and Mackinney may form a supplement to the illumination photometers, and be used to show the considerable influence surrounding surface brightness and surface reflection have on the readings of illumination photometers.

The new instrument also emphasizes the fact that the art of illumination measurement is being carried to a refined point that appears to be somewhat unnecessary if people would only intelligently use their eyes. But many people—we are afraid they are of the majority—will not intelligently apply the law of the eye to a determination of illumination; and so the illuminating engineer, in the exercise of his art, wants to prescribe, accurately measure what is prescribed, and see that there is adherence to the prescription that he thinks the most suitable for purpose and conditions. In our opinion, the practical usefulness of an invention such as that now before us will be found in the ability it confers of judging as to the relative brightness and reflective power of surfaces of all kinds. That is a matter which has been largely left to purely visual observation, so that oftentimes there has been erroneous conclusion; and there is, in the result, but sparse knowledge of this subject at the present time. The new instrument is already proving that some of our beliefs

formed from observation will have to be considerably revised when subjected to the more exact disclosures of Messrs. Dow and Mackinney's invention.

The main question that will be asked is as to the constancy of the instrument. We have only yet the attestations of the inventors on this point; but an instrument so comparatively inexpensive, and demanding so little labour in use, will not be long before it has application by many hands and eyes, and so be put to critical trial. Examining the instrument solely from a structural point of view, it may be said that it has been cleverly designed; and providing there is perfect uniformity in manufacture, we fail to see, on limited acquaintance, where there is any chance of inconstancy save in the electric incandescent light that is used as the standard. But this, as is explained, can be frequently and readily verified. The instrument, according to curves exhibited before the Optical Society, has been brought up to such a pitch of perfection that error comes well within ± 5 per cent. For all practical purposes in illumination, nothing better is wanted. If, as is intended, the instruments are tested by the inventors themselves before being sent out, to see that this range of error is not exceeded, then they should not hear much in the nature of complaint. This is, however, an instance in which the fate of the instrument will be decided by the experience derived from its use by observers other than the inventors, from whom meanwhile congratulation cannot be withheld.

The Development of an Idea.

Another over-capitalized Company. Expert gas men had no difficulty in forming this conclusion by the merest glance at the first copy of the prospectus of the East Hants Gas Company, Limited, that they received last week, or at the first peep at the abridgment of the prospectus as freely advertised in the daily papers during the week. But the thing that at once struck us was that the East Hants Company appeared to be the consummation in the development of a bright idea. It was not difficult to find some justification for the belief. In February last, a prospectus was issued of a new gas venture under the title of the Liphook Gas Company, Limited, with a share capital of £5000; in June, the prospectus of the Liss Gas Company was issued, with a capital of £10,000; in October, the prospectus of the East Hants Gas Company, Limited, is issued with a capital of £30,000, of which there are now offered 1300 "A" shares of £10 each, ranking for a cumulative preferential dividend of 8 per cent., and 950 "B" shares of £10 each, entitled to the surplus profits of the Company, and unrestricted as to dividend. The proposed issue of the East Hants Company therefore amounts to £22,500. There is a pretty little association between all these three ventures; and there is the indication of all three being, as it were, part and parcel of one scheme. Some of the Directors certainly have a strong nominal likeness.

LIPHOOK DIRECTORS: E. H. Jellett, J.P., Andover, Arthur Gibson, Reginald Victor Steed (Gas Engineer).

LISS DIRECTORS: E. H. Jellett, J.P., Reginald Victor Steed (Gas Engineer), Thomas Webb, J.P., Mayor of Andover.

EAST HANTS DIRECTORS: E. H. Jellett, J.P., Thomas Webb, Alexander Ritchie, F. W. Talbot.

There is a connection between the three concerns established in the Boards, all concerns having their birthdays in 1910; and there is a progressive idea as to the capital requirements of the three Companies. Dipping into our large knowledge of the gas engineering profession, we do not recognize Reginald Victor Steed as coming within its range; but as we should be extremely sorry to do him an injustice, we should be pleased to learn from him something as to the qualifications that entitle him to describe himself as a "gas engineer" on any prospectus or elsewhere, as a matter of fact.

Repudiation.

The prospectuses are so framed (the Liphook and Liss prospectuses are almost identical) on the models of those of the Eaton group, that people may very well have been pardoned for labouring under the impression that their origin had some association with that notorious pile of wreckage. But the Boards have held up their hands in pious horror at such a thought; and so in each case a denial has been issued, signed by different Secretaries; and the denials bear the marks of a common origin.

Important Notice to Intending Applicants.

The Directors consider it their duty to inform intending applicants that the Liphook Gas Company, Limited, is not connected with the group of companies known as the "Eaton" group. It has been formed to meet a great local demand for a gas supply, and offers to persons interested in gas company investment an opportunity of joining, at par, what promises to become and has every prospect of providing a safe and secure 10 per cent. gas investment, and substantial increase in capital value.

By order of the Directors,

Feb. 19, 1910. WALTER HUGHES, *Secretary.*

Important Notice to Intending Applicants.

The Directors beg to inform intending applicants that the Liss Gas Company, Limited, is not connected with the group of companies known as the "Eaton" group. It has been formed to meet a great local demand for a gas supply, and offers to persons interested in gas company investment an opportunity of joining, at par, what promises to become and has every prospect of providing a safe and secure 10 per cent. gas investment, and substantial increase in capital value.

By order of the Directors,

June 11, 1910. REGINALD DALLEY, *Secretary.*

Important Notice to Intending Applicants.

The Directors consider it their duty to inform intending applicants that the East Hants Gas Company, Limited, is not connected with the group of companies known as the "Eaton" group. It has been formed to meet a greatly increased local demand for gas, and offers to those interested in gas company investment an opportunity of joining, at par, what promises to become, and has every prospect of providing, a safe and remunerative gas investment, and substantial increase in capital value.

By order of the Directors,

Oct. 10, 1910. F. P. ADAMS, *Secretary.*

Mr. F. W. Talbot, as vendor in the case of the East Hants Gas Company, joins the Board after allotment. It would be interesting to know whether Mr. F. W. Talbot was ever associated with the Board of the Laindon Company, which has proved so disastrous to those who invested money in it.

Financial Considerations.

In the East Hants prospectus, Mr. C. Chambers Smith is the Consulting Engineer. He is described as a member of the Institution of Municipal and County Engineers. His qualifications for forming estimates as to gas-works property and prospects are not known to us. This gentleman has drawn up a truly interesting estimate as to the revenue and expenses of the East Hants Company, the former of which shows an annual sale of 20 million cubic feet of gas. Here we come to the consummation of the triangular featured scheme. No less than 12 million cubic feet of this consumption is to be provided by the estimated business of the Liphook and Liss Companies—5 millions by Liphook, and 7 millions by Liss; the East Hants Company selling them the gas they require in bulk. Now this business of 20 millions on the proposed issue of £22,500 capital represents the extravagant capital of £1125 per million cubic feet; and yet outside manufacture the East Hants Company have only to find capital in the distribution department for 8 million cubic feet—the distribution capital associated with 12 millions of business being the obligation of the Liphook and Liss Companies. The poor little Liphook and Liss Companies are to pay the fearful price for gas in bulk of 3s. 10d. per 1000 feet; and as it is proposed they shall charge 5s. to ordinary consumers, it is stated, in one or other of the prospectuses, that there will be 1s. 2d. profit remaining for them. But the 1s. 2d. has to bear not only the capital charges, but all the administration and working expenses. Mr. Chambers Smith kindly makes out that the net profit of the East Hants Company will amount to very nearly as much as the working expenses—£2281 10s. compared with £2981. Estimates in connection with new gas flotations have been constantly falsified. However, this is company promoting *in excelsis*. It is all so delightfully simple. Find two small districts in which to supply gas; and then in a third small district form another company for its supply, and for the supply of the other two companies in bulk. That is high-class scheming. One company, with a few—a very few—thousands of capital could by itself have supplied the three areas.

Oil Prices.

The question was put to us the other day as to why it was the price of gas oil was on the decline while the price of coal was hardening. There is no objection to oil at low prices in the gas industry; and any interest in the cause only arises from curiosity. It seems, however, that the Standard Oil Company are concerned in the matter. It would be surprising if they were not. They have had their eyes upon their newly-born rivals in Europe; and according to the "New York Times," there is to be war upon them. In making war, the *modus operandi* of the Standard Oil Company consists in using their huge resources to break-down rates to such a level that those who cannot offer resistance to their might must go. The statement published by our American contemporary says—putting the matter shortly—that notwithstanding the enormous over-production of crude oil, seventy new oil companies have been promoted during the last six months on the English and Continental markets. In view of this condition of affairs, the Standard Oil Company have inaugurated a campaign to increase the world's consumption of refined oil by a reduction of the price abroad, and especially in the Far East, where, with the enormous population, there is an unusual opportunity. To accomplish this, considerable reductions in prices have already been made, not only in the East, but in Europe. Looking in another direction for information, we find it stated that "there are not wanting experienced observers who argue that there is really no 'rate war' at all, and that the cut in prices has merely been rendered necessary by the enormous accumulation of oil stocks, especially in America. It is known that, during the past five years, the production in America has more than doubled, and there are in the States at the present time over 100 million barrels of crude oil in storage." It is also argued that developments in the production of oil will cause such an expansion in its use that what is now regarded as an undesirable position will eventually turn out to be a good thing for the oil industry. At such a time as the present, the spreading abroad of optimistic views will possibly help to buoy-up the spirits of investors in oil.

Expansion at Exmouth.

Among the progressive undertakings in the smaller towns, the Exmouth Gas Company are well entitled to a place. The Company have been steadily advancing for many years, and may be expected to make even more rapid strides as they come to exercise the powers of development in the surrounding district which Parliament has recently conferred upon them. There is still in Exmouth itself room for the profitable expansion of the Company's business; and there is every reason to anticipate for the undertaking a prosperous future. If it has suffered at all in the past, it has been from the exercise of over-caution. As the Chairman had occasion to point out last week, those who were associated with the Company in the early days did not look far enough ahead. It was a common failing with the pioneers of the gas industry. They did not foresee the expansion of which it was capable. Their horizon was circumscribed by the doubts and difficulties surrounding a new business, every essential feature of which was a departure from custom. Launching thus upon an unknown sea, it is little wonder that they thought more of the needs of the immediate present than of those of the future. If they could have seen how the demand for gas was to grow, they might have made provision for the expansion. Works might have been laid out differently; and certainly sites could, in hundreds of instances, have been better chosen, if those who were in at the beginning had had the gift of prescience. The same may, of course, be said of the pioneers of railways, and of many other industrial concerns. In many ways we have to pay for the short-sightedness of our predecessors, as those who come after us may have to pay for our want of appreciation of the trend of events. All that can be done is to make the best of the circumstances, rectify the mistakes of the past as we may, and guard as far as possible against repeating them. The Exmouth Gas Company are doing this. They have obtained able guidance in Mr. P. S. Hoyte, the capable Chief of the Plymouth and Stonehouse Gas Company, who, being acquainted with the local circumstances and conditions, is well fitted to render Exmouth good service as Consulting Engineer. Messrs. Willey and Co., who have carried out the latest addition to the works, have been associated with the Exmouth undertaking from the beginning, and have been responsible for all improvements and alterations since effected. Association of this character is as remarkable as it is honourable.

The Duties of Auditors.

An address to which a considerable amount of attention has been drawn was delivered some days ago by Mr. Charles Duguid (whose name is well known in the City as that of a writer on financial topics) at the London Institution, on the position and duties of auditors in connection with the certification of accounts of public companies. At the outset he dealt strongly with the need for plain speaking on the part of auditors, whose certificate, he urged, "ought to say what it means," and not merely give hints. This would certainly seem to be the case, if it is intended to convey information to the general body of shareholders. Then the lecturer found fault with the reading of an auditor's report at a meeting, instead of printing it in full in the balance-sheet, as "a way towards hushing it up." As was rightly pointed out, when a report is read at a meeting, its technical terms cannot be grasped without difficulty, even by the shareholders present; while the great majority of shareholders who did not happen to attend the meeting would never see the report, unless they went to the trouble of applying and paying for it. "You must never forget," said Mr. Duguid to his audience, "that as auditors you exist in the interests of the shareholders against the directors." Auditors, he went on, existed in a great measure to see that the directors rendered to the shareholders a faithful account of their stewardship—to see that the shareholders were aware of the true position of the business which belonged to them. The shareholders themselves were by no means allowed to escape criticism in connection with the question of auditing. After admitting that it was much easier for the auditors of a company to act with the directors than with the shareholders, Mr. Duguid remarked that "the directors are a small organized body, with whom the auditors may be in frequent contact; the shareholders are an unorganized mob, apathetic, and with no sense of gratitude. If shareholders procured the auditors who, by their stupid apathy, they deserve, they would be represented by a class of auditors falling far short of the class which they fortunately possess. I say this deliberately, in spite of all my criticisms. I believe that at the root of any shortcomings there may be in our system of audit, lies the apathy of the shareholder." As to remedies, one mentioned (though it was admitted there are objections to it) was that company auditors should be rendered more independent of both directors and shareholders—that they should be appointed as at present, nominally by the shareholders, but that they should not be removable by directors, shareholders, or themselves without application to (say) the Board of Trade. Finally, Mr. Duguid urged that auditors should receive higher fees, and that these could be raised, in cases where there happened to be a "useless" director on the board, by clearing away this director, and handing his fees over to the auditor! A novel idea—but one which would not be easy to put into practice. The points of the lecture were not, of course, based on experience gained in connection with sound gas company accounts.

Personal.

Mr. JACQUES ABADY has been instructed by the Oriental Gas Company to proceed to Calcutta in connection with the public lighting contract recently entered into with the Corporation of Calcutta. Mr. Abady anticipates being back early in the New Year. He leaves next Friday by the P. and O. steamer *Morea*.

Alderman PHILLIPS has consented to accept the Mayoralty of Salford for the ensuing municipal year. He has been a member of the Town Council for 25 years, and is Chairman of the Gas Committee. In presenting the requisition to Alderman Phillips at last Wednesday's meeting of the Town Council, the Mayor (Alderman Snape) said his work as Chairman of the Gas Committee was deserving of the highest praise; adding that if the undertaking had been a private company, Alderman Phillips would have been entitled to a very substantial salary.

After his sojourn at home since the end of May last, Mr. JAMES C. WATSON, the Engineer of the Oriental Gas Company, commences his return journey to Calcutta on Friday. He will travel *via* Marseilles, by the *City of London*. The time at home has been partly spent in rest and holiday, and, naturally, partly in the consideration of matters relating to the welfare of the concern of which he has charge. One result of this will be that, on Mr. Watson's arrival in Calcutta, the finishing touches will be given as rapidly as possible to the work of modernizing the plant which has been proceeding as opportunity favoured for some time past. *Bon voyage*, health, and an abundant success on again actively taking up the duties of his office, are the wishes that will accompany Mr. Watson from a great number of friends on his once more leaving home.

THE VISIT OF THE GERMAN ENGINEERS.

An Interchange of Courtesies.

We have received from Mr. Walter T. Dunn, the Secretary of the Institution of Gas Engineers, copies of a telegram sent by Herr Prenger, the President of the German Association of Gas and Water Engineers, to Mr. Alexander Wilson, the President of the Institution, on the departure of the members of the Association from Great Britain on the 9th inst., at the close of their visit, and of Mr. Wilson's reply. They were sent, at the suggestion of Mr. Wilson, with a view to publication.

[Copy of Telegram.]

Dover Pier, 9th October, 1910.

Wilson, President of the Institution of Gas Engineers.

Leaving Great Britain after the instructive and enjoyable days with our colleagues and friends, we once more thank you most heartily for the great hospitality shown to us and send best greetings. Hoping to meet our friends again before long.

Prenger.

[Copy of Letter.]

11th October, 1910.

Herr Direktor Prenger,

Gas, Water, and Electric Works, Koln.

My dear Mr. Prenger,

I beg to acknowledge with thanks the very kind telegram you sent me from Dover Pier.

We are all very pleased indeed to know that you enjoyed your short visit to this country, and we all trust that you have arrived safely at your various homes, and have found everything right both there and at your works.

We would ask you to accept our thanks for giving us the opportunity of enjoying such a very pleasant week in the company of our German friends.

We have all come to the conclusion that it would not only be for the benefit of our industry, but for the peace and goodwill of the various nations, if such visits could be arranged more often.

Kindly accept my best wishes and kind regards, and believe me to be,

Yours very truly,

(Signed) Alex. Wilson,

President of the Institution of Gas Engineers.

Obituary.

We regret to record the death, in his 61st year, after a short illness, of Mr. Henry Graham Harris, a partner of the late Sir Frederick Bramwell, on whose decease he became head of the firm of Messrs. Bramwell and Harris. He was a member of the Institutions of Civil and Mechanical Engineers, was Vice-President of the latter body, and was on the Council of the Society of Arts.

By the death of Mr. John Birch Paddon, which took place at his residence, Drymma, Neath, on Friday, the 7th inst., the gas engineering profession loses one who for a long period held an honoured and a prominent position in it. Though closely identified with several successful gas undertakings, Mr. Paddon will be best remembered by his work in connection with the amalgamation in 1881 of the Brighton and Hove General Gas Company and the Brighton Gaslight and Coke Company, and also with the designing and erection of the well-known works of the Company at Portslade, which were visited by the Société Technique du Gaz en France in 1901, and by the Institution of Gas Engineers on the occasion of their meeting in London two years ago. The works were brought into use in 1872; and under Mr. Paddon's supervision considerable improvements were made in them. A novel feature in the construction of the gasholders was the arrangement which he introduced, and which came to be named after him, for the purpose of strengthening the guide-framing to enable it to withstand the force of the Channel gales. He filled the position of Engineer and General Manager of the Company for some twenty-six years, relinquishing it in 1886, and being succeeded by his Assistant, Mr. Joseph Cash. He was then elected to a seat at the Board, and subsequently became Chairman of the Company—a post now held by his son, Mr. A. Matthews Paddon, M.Inst.C.E. At the time of his retirement from active business in 1902, besides being Chairman of the Brighton Company, the late Mr. Paddon occupied a similar position in the Lea Bridge, Colney Hatch (now Southgate and District), East Cowes, and Malta and Mediterranean Gas Companies; and he was a Director of the Gaslight and Coke Company. For many years he was a prominent and well-known figure in the Parliamentary Committee-rooms, where he appeared in support of numerous Bills promoted on behalf of gas undertakings. He was elected an associate member of the Institution of Civil Engineers in 1861, and was transferred to full membership in 1871. He was a Justice of the Peace. Mr. Paddon, who was in his 86th year, enjoyed good health until comparatively recently. He leaves a family of two sons and a daughter.

GAS STOCK AND SHARE MARKET.

(For Stock and Share List, see p. 217.)

In spite of one or two adverse factors, the Stock Exchange did not have at all a bad time last week, and most markets closed higher. The French strike was at first a disturbing element; but its handling by a courageous Government very quickly restored the position. The storm centre was the Rubber Market. The opening day was quiet and rather uneven. Government issues were steady, and Railways strong and rising on labour prospects. Americans began to improve. But the Foreign Market was rather heavy, and South Africans weak. Tuesday showed weakness. Consols fell $\frac{1}{8}$, and Americans were almost the only firm spot. Wednesday was a little brighter. Consols were unchanged, and Railways were watching Paris. But there was a recovery in other markets; the settlement promising to produce no difficulties. Thursday's business was on a much reduced scale; the Hebrew fast-day keeping many away. The tone was mostly good, though Consols lost $\frac{1}{8}$. The Foregn Market recovered confidence. On Friday, the tendency was quite fair in almost every department, excepting the afflicted Rubber Market. There was good buying of gilt-edged securities; Rails were firm; Americans strong; and foreign affairs brightening. This state of things, with some degree of activity, continued on Saturday; and, with the death of the French strike, the general close was cheerful. In the Money Market, there was an ample supply; and rates ruled easy; but shortly before the close the terms for discount were inclined to harden a little. Business in the Gas Market showed no falling off in the aggregate; but it was almost monopolized by three or four of the larger undertakings. Several issues, however, which were not dealt in, advanced their quotations; and the general tendency all round was good. In Gaslight and Coke, the ordinary was steady at from 106$\frac{1}{2}$ to 107 for the greater part of the week; but towards the close it touched 106, and the quotation was pulled down half-a-point. The secured issues were firm and rather active. The maximum realized from 87$\frac{1}{2}$ to 88$\frac{1}{2}$, the preference from 104$\frac{1}{2}$ to 105$\frac{1}{2}$, and the debenture 80$\frac{1}{4}$ and 81$\frac{1}{4}$. South Metropolitan was unchanged at from 121$\frac{1}{2}$ to 122$\frac{3}{4}$. Commercials were again untouched, as in the week before. Among the Suburban and Provincial group, Alliance and Dublin was done at 89, British at 44$\frac{3}{4}$, Brighton ordinary at 160 (a rise of 2), South Suburban at 121$\frac{1}{2}$, and Tottenham debenture at 98$\frac{3}{4}$. On the local Exchange, Liverpool "A" was marked at 221. In the Continental companies, Imperial was steady and unchanged at from 187 to 188$\frac{1}{4}$, ditto debenture realized 95$\frac{1}{4}$ and 95$\frac{5}{8}$, and European fully-paid 23$\frac{3}{4}$. Among the undertakings of the remoter world, Monte Video changed hands at 12$\frac{3}{16}$, Primitiva at from 7$\frac{3}{8}$ to 7$\frac{9}{16}$ (a rise of $\frac{1}{8}$), and ditto preference at from 5$\frac{3}{16}$ to 5$\frac{5}{16}$—a rise of $\frac{1}{8}$.

ELECTRICITY SUPPLY MEMORANDA.

The Ease of Assertion—Public Lighting and Disturbance of the Peace of Mind of Electricians—Fire Alarms in the Electrical Press—Rival Departments and Rate Aid—A Hard Nut at Kingston.

One of the interesting features of the controversy that continues to rage—through the mortification of our electrical friends at the success of the inverted gas-burner in tendering competition, at the expiration of street-lighting contracts, with electric lighting—is the ease with which assertion is made by our electrical contemporaries, and generally without the support of concrete example. One can always plunge into the abstract very liberally, and then sit complacently through criticisms of the performance. But it is quite another thing to give support to the assertion that can be analyzed, and so enable the weaknesses of the assertion to be exposed. Only last week it was shown in the "Memoranda" that, if it is necessary to come down to a price for current of 0·5d. per unit to compete with the vertical incandescent gas-burner for street lighting, then the price must be "cut" still closer to compete with the inverted gas-burner; and that, if it is necessary to fall to such a price for current in public lighting, then what a farce it is for electrical people to tell private consumers that, with electricity at from 3d. to 6d. per unit, electric lighting is cheaper than lighting by the inverted gas-burner. We have the "Electrician" informing its readers that the Manchester Electricity Department "has laid mains specially for street lighting, and is in a position to give the inhabitants of Cottonopolis a cheaper and better form of lighting for their streets than they have at present." In effect, this is saying that the department can give cheaper and better lighting than the Gas Department, with all the improvements in incandescent gas-lighting that they have at hand. Now is this true? We should like to see the nature of the support on which the assertion is founded. There is a contributor of the "Electrical Review," too, in an article on "High-Power Electric Incandescent Fittings," saying that "the electrical contractor is now in a position to offer lamps and fittings which easily compete with gas lanterns in point of first cost and maintenance." The ease of assertion, without going any farther, is a well-developed characteristic of our electrical friends; but we do wish they would push out a little more into the open. When they have in the past ventured a short way out, they have relied entirely on the prices charged to lighting authorities by their own Electricity

Departments. There is Marylebone, for instance. The prices at Marylebone were examined by us recently [Sept. 13, p. 706] in the light of the tender for inverted lamps for the streets of Holborn. And last week, again, examination was made of other published prices. It is easy enough to assert; but in business, people want something a little more substantial.

The Holborn lighting contract is not yet settled. Electrical interests are trying to move heaven and earth to save this contract from going the way of Westminster, Hackney, Bethnal Green, Finsbury, and Stoke Newington. They have even moved some of the shopkeepers in Holborn to sign a petition against gas lighting retaining the field. "Meteor," of the "Electrical Times," is in the seventh heaven of delight. "The supporters of gas on the Borough Council," he says, "are being presented with a nasty pill in the shape of a petition from their constituents against acceptance of the Gaslight and Coke Company's proposals for street lighting." It is not such a nasty pill after all. The capital statement in the petition is "that the gas lighting in the borough is inadequate, and therefore detrimental to our business." The electricians and shopkeepers have overlooked the fact that it is not the present gas lighting that the Gaslight and Coke Company are proposing to retain, but they are offering, through the inverted gas-burner, a largely increased illuminating power in the streets at a lower cost than the existing gas lighting. The statement in the petition is a cunning device of the electrical spirits at the back of the petition; but the Council will see through it. And as to the declaration that the present gas lighting is detrimental to the business of the shopkeepers of Holborn, there are no visible signs of any languishing of their businesses. On the contrary, there have been indications in recent years of an increasing opulence on the part of the shopkeepers of Holborn. The petition also states that "the neighbouring boroughs of St. Marylebone and St. Pancras have adopted more modern methods, with complete success and economy." The Marylebone "economy" was, as stated above, compared, in our issue of Sept. 13, with the economy offered by the Gaslight and Coke Company to Holborn; so that what was then written comes in opportunely with the presentation of this petition. It is also submitted that competitive tenders should be invited. This is being done; but the Gas Company are put to unfair disadvantage by the publication of the terms of their offer. "Meteor" remarks: "We thought the time had gone by when local authorities dared to place contracts of such magnitude without first inviting tenders publicly." He must have been asleep lately, or he would have remarked the number of local authorities who have been placing contracts for electric lighting with their electricity departments without first publicly inviting tenders. It is one of the things of which private enterprise in gas supply is constantly complaining; and it is one of the abuses of local government that has grown up with the development of municipal trading in electricity. After all, the thoroughfare known as Holborn does not constitute the administrative area of the Borough Council; and the Borough Council have to consider the interests of the borough as a whole, and not those of a single thoroughfare. At the same time, the interests of the thoroughfare will be amply considered and safeguarded by the adoption of modern methods of gas lighting, instead of electric lighting.

The electrical papers have been striking out right and left at us recently for calling attention to the disastrous fires that are known to have occurred, with fatal results, through the premises being lighted electrically, and to the increasing number of fires that occur, and which are labelled "cause unknown." We are not in the least degree injured by the repeated assaults of our perturbed friends; nor is there any intention on our part to refrain from comment on these matters by the transparent cover the electrical press chooses to employ in the vain desire to hide its own uncomfortable feelings. Several of the editors of our contemporaries have joined hands and formed a ring, and danced with glee, round a paragraph that appeared in the "Globe" the other day announcing that a few window curtains had been destroyed by coming into contact with gas-jets. This is the exciting piece of news:

> **The severe storm had the remarkable effect in London of causing, in rapid succession, no fewer than six outbreaks of fire, occurring north, south, east, and west, within a period covered by three hours. In each case they were caused by curtains at open windows being blown into the gaslight.**

It will be noticed that the paragraph points to the occurrence as being "remarkable." Also it only mentions the destruction of curtains. Nothing is said of a loss of life, or thousands of pounds waste of property. Remember Clapham and Accrington! However, the "Electrician" considers the intelligence as to these curtain fires "very significant at the present time when fires of unknown origin are of only too frequent occurrence." These fires were not of unknown origin. Then it goes on to unconsciously pay gas one of the best tributes to its safety that has ever escaped electrically wielded pen. "When one considers the *multitude* of gas-jets which are in close proximity to inflammable materials, and that a draught may be sufficient to bring such materials into a position where they are liable to catch fire, *one can only marvel that serious conflagrations are not more numerous.*" Thanks. The fires at Clapham, Accrington, and certainly one of those at Brixton were caused by contact of inflammable goods with electric lamps or wires; and the public, the authorities, and drapery assistants recognize the danger. We read in the evidence at an inquest in connection with one of the Brixton fires that the girls had become so unnerved at the happenings in large drapery premises, the main parts (if not all) of which are electrically lighted, that, before going to sleep, they placed their clothes in readiness for escape should fire break out. Last week, in a paragraph we referred to a statement in Messrs. Jones and Higgins' newly-issued drapery catalogue that the "premises are lighted throughout with electric light." But, in a companion and facing statement, the public were desired to be assured of safety, inasmuch as the premises are "protected against fire by Grinnell Sprinklers." In the original "electric light" and "fire" are in black capital letters. Messrs. Jones and Higgins know the public; and they are aware of the alarm that has been created lately. It is indeed a mighty obstruction that has been erected against the progress of public credence in the still advertised electrical fiction as to the superior safety of electricity. The force of habit is undeniably great with our electrical competitors. Or "perhaps it is a form of humour with them."

The paper just referred to has been commenting on the report that the chief officials of the Gas and Electricity Departments of the Manchester Corporation have recently made regarding the result of their conferences to see what could be done to smooth away differences of opinion, and to enable them to work together in greater amity. The point upon which our contemporary largely expanded was the agreement between the chief officials as to the propriety of a uniform basis of profit contribution in relief of the rates, which, in view of the position of the respective standing capital debts of the two departments, would mean that the Electricity Department would hand over rather more than the Gas Department. The "Electrician" thinks that "it is a defect of the basis that it introduces this anomaly." We do not think the Electricity Department is likely to sing much of a song about this anomaly; for it would be very glad if an arrangement were come to by the City Fathers whereby the department would be let off so lightly. It remembers the years upon years that the Gas Department has been dropping into the municipal maw some £50,000 annually. It also fully remembers that from the gas consumers, since the gas undertaking has been municipally controlled, there has been extracted in aid of the rates an aggregate amount greater than the sum of the loans raised for the concern. The Electricity Department is more concerned over history not repeating itself in its case than it is that it should now be called upon to pay rather more annually than the Gas Department. But no good can come of saying much about this matter at present. The City Council have yet to pass a resolution confirming the principle that the chief officials say ought to be adopted. And we doubt the passing.

Here is a little riddle for solution at Kingston-on-Thames: Why is it that six years ago the electricity undertaking made a profit, and has not done so since? We are not going to attempt to answer it, beyond saying that what is wrong must be looked for at the base of the business, the character of which has been entirely altered by the fact that, under the conditions created by development, the average return per consumer has fallen, while the average standing charges per consumer has not showed a *pari passu* recession. But the weary councillors of Kingston would be glad if someone would tell them how best to assure themselves against annually recurring deficits. They have the unpleasant duty before them this year of putting on to the rates another ½d. in the pound through the loss incurred by the electricity undertaking; and really they do not know quite where they are. The Electricity Committee are badgered all round over their capacity for managing a concern at a loss. They have in recent years made coal, cables, and metallic filament lamps the successive scapegoats; and now they will soon be at a loss for something fresh that will enable them to make their peace with the public. But Mr. Councillor Wyeth, who describes himself as "unfortunately a member of the Committee" of three years' standing (so he ought to know something), avers that the Committee have no policy, they work in the dark, they vote large sums of money not knowing whether it is going to be remunerative, and they make estimates, but they have not the ghost of an idea as to whether there will be a profit or a loss. This is a sad reflection on municipal trading in electricity. What would be thought of any member of the Council who, year after year, estimated losses in his private business, and did not do something to turn the loss into a profit? What would the shareholders of an Electricity Company think of a similar proceeding on the part of the Directors? It is an immoral proceeding for a municipal authority to persistently look to those who are non-consumers of electricity to subsidize the electricity undertaking. But triumphantly cry the councillors, when a suggestion is made to raise the price of current to a figure that would make the concern pay, "then the ratepayers generally would have to pay more for the public lighting;" and already the Council cannot justify the change from gas to electricity. How different things would be if the supply were in the hands of a company! Why there should be such fright over raising the price of current to private consumers, we cannot understand, when electricity is stated by electrical station managers to be the cheapest and safest illuminant, and possess so many other advantages that the days of those who use it should be prolonged to those of Methuselah. But there the fact remains that electrical people are frightened over advancing the price. And there is the further fact that, whereas when there were fewer consumers on the books at Kingston, a profit was made, with an extension of the capital expenditure and a greater number of consumers, there is a loss. Obviously there is something wrong. What is it?

GAS ACTS FOR 1910.

[Fourth Article.]

Resuming the review of the Local Authority Acts which contain powers relating to gas supply, there has first to be noticed the measure of the Little Hulton Urban District Council. This is invested with more than ordinary interest, as it incorporates a scheme for the supply of coke-oven gas from the coke-ovens of the Earl of Ellesmere. The Council are empowered to purchase the portion within their district of the gas distribution system of the Salford Corporation; the purchase price being by agreement £7500. The proposal, however, to acquire a part of the canalization of the Farnworth and Kearsley Gas Company has dropped out. The purchase money is to be applied by the Salford Corporation to gas-works purposes to which capital is properly applicable, or to the repayment of any outstanding money borrowed for gas-works. The limits of the supply of gas by the District Council are to embrace the portion of their district not included within the limits of supply of the Farnworth and Kearsley Gas Company. The Council have been clothed with all the ordinary authority of gas suppliers; and confirmation is given to the agreement with the Earl of Ellesmere, the terms of which were fully stated in the "Journal" for Feb. 1 last. The maximum price of gas is placed at 3s. 6d. per 1000 cubic feet of gas of a standard power of 14 candles tested by the "Metropolitan" No. 2 burner. The Council are granted power to borrow such sums as may be necessary for the purchase of the portion in question of the gas undertaking of the Salford Corporation, £300 for laying a new main, £1400 for working capital, and, for the extension and improvement of the works, such sum as may be necessary as approved by the Local Government Board. The amounts required for purchase and for the new main are to be repaid in thirty years; and the working capital within ten years. [*Parliamentary Agents: Messrs. Lees and Co.*]

The Mallow District Council have obtained the powers sought in respect of the purchase of the property of the New Mallow Gas Company, Limited, and the supply of gas within specified limits. The Council are to give notice within three months after the passing of the Act of their intention to acquire the undertaking. The lands are specified upon which manufacture may be carried on. Most of the powers sought are in the ordinary form; but with regard to the price to be charged for gas supplied through meter, it "shall not at any time exceed such price as may be determined by the Board of Trade within one month after the price or consideration for the purchase of the undertaking of the Company has been determined." The illuminating power of the gas is to be not less than 14 candles tested by the "Metropolitan" No. 2 burner. The Council are to be empowered to borrow the sum requisite for the purchase of the works. This is to be repaid in 35 years from the dates of borrowing, instead of the 40 years mentioned in the Bill. The money required for the extension and improvement of the undertaking, is left to the sanction of the Local Government Board. [*Parliamentary Agents: Messrs. Lees and Co.*]

The Matlock Bath and Scarthin Nick District Council have in their Act obtained relief from the provision imposed upon them in 1896 as to the removal of the gas-works from the present site. The provision referred to seven years from Jan. 1, 1897; but the period was extended to a further seven years. There has, in the present Act, been repeal of these clauses; and the Council are authorized to maintain and extend the works on the old site. Succeeding clauses in the Act alluding to gas supply are of the usual form, save that we see the 10 and 15 per cent. discounts clause has been adopted. The Council for the purpose of the gas undertaking are authorized to borrow £3000, to be repaid in 30 years—not 40 years as suggested in the Bill. Further sums may be borrowed with the sanction of the Local Government Board. [*Parliamentary Agents: Messrs. Roberts and Co.*]

The Middlesbrough Corporation are in their Act empowered to supply gas-fittings, &c.; and they have conferred upon them several modern gas powers. The standard illuminating power of the gas is prescribed at 12 candles, tested by the "Metropolitan" No. 2 burner. The proposal as to a limit discount of 15 per cent. on gas supplied to large consumers for power purposes has been erased. In the financial section of the Act, it is decreed that "all expenditure made by the Corporation before the passing of this Act for the purpose of providing and laying down gas-mains, not exceeding the sum of £8500, and for the purpose of providing and fixing gas-meters, not exceeding the sum of £5500 in excess of the amounts authorized to be borrowed for such purposes, is hereby ratified and confirmed; and the Corporation shall repay to the account or fund out of which such expenditure was respectively made the whole of such expenditure out of the moneys by this Act authorized to be borrowed by them for those purposes respectively." The new borrowing powers for the gas undertaking now stand as follows in the Act: In respect of gas-mains, £8500; and of meters, £5500 [These are the two sums referred to in the foregoing provision]; for gas-mains on the security of the district fund and general district rate, any sums not exceeding £26,000; and meters and fittings on the security of the district fund and general district rate, not exceeding £20,000. Additional money may be borrowed with the consent of the Local Government Board. The period for the repayment of the money for meters and fittings has been altered to ten years; and in regard to that for mains, to 30 years. A reserve or renewals fund is provided for, to be built up from the difference between receipts and expenditure. The clauses regulating the sale of coke in the streets have been altered; and now read as follows:

(1) Every person who shall sell or offer for sale coke from any vehicle in any street, shall sell the same or offer the same for sale in sacks with a metal label affixed to the top of every such sack indicating the correct legal weight or measure of coke therein.

(2) Any purchaser of coke from any vehicle in any street and any inspector of weights and measures or other officer appointed by the Corporation may require that any coke sold or offered for sale as aforesaid be weighed or re-weighed, or measured or re-measured, by any instrument or measure stamped by an inspector of weights and measures. Provided

(*a*) No seller of coke or person in charge of a vehicle in which coke is carried shall be required under this section to carry coke beyond such distance not exceeding half a mile as may be prescribed in that behalf by the Corporation;

(*b*) Where any such coke has at the instance of the purchaser been weighed or re-weighed, or measured or re-measured, in pursuance of this section, and found to be of the weight or measure stated in that behalf by the seller of the coke or the person in charge of the vehicle, the purchaser shall be liable to the payment of all reasonable costs actually incurred of, and incidental to, the weighing or re-weighing or measuring or re-measuring.

(3) If the owner or any person in charge of any vehicle from which coke is being sold or offered for sale in any street wilfully makes any false statement as to the weight or measure of the coke in any sack, or wilfully increases such weight by damping such coke, or wilfully does any other act by which the purchaser of the coke shall be defrauded, or fails to comply with the other provisions of this section, or obstructs any weighing or re-weighing, or measuring or re-measuring, authorized by this section, he shall be liable for every such offence to a penalty not exceeding £5.

(4) Public notice of the provisions of this section shall be given forthwith after the passing of this Act by advertisement in two newspapers published or circulating in the borough, and by a notice affixed outside the Town Hall, and by the distribution of hand bills amongst persons affected or likely to be affected, as far as such persons can reasonably be ascertained. A printed copy of the notice affixed outside the Town Hall, sealed with the corporate seal, shall be sufficient evidence that the provisions of this section have been complied with.

The Corporation are allowed to form a fund to be called "The Accident Fund," to provide for meeting claims upon them under the common law, the Employers' Liability Acts, or the Workmen's Compensation Acts. The fund is to be limited to £12,000. [*Parliamentary Agents: Messrs. Durnford and Co.*]

In the section of the Omnibus Act of the Middleton Corporation dealing with gas, the prescribed illuminating power is placed at 14 candles, using the "Metropolitan" No. 2 burner for testing. The other clauses are of common form. Protective provisions for the Lancashire and Yorkshire Railway Company have been inserted. In the financial section, a clause appears empowering the Corporation at any time, after Jan. 1, 1940, to require the persons entitled to any annuities provided for under section 56 ("Lighting Rates, &c., to be Charged with Annuities") of the Act of 1861, and for the time being outstanding, to accept redemption of any such annuities on payment of the then fair value of the annuity or annuities redeemed, and the amount of such value is, if not agreed, to be settled by arbitration, in accordance with the provisions of the Arbitration Act, 1889, except that the arbitrator shall be nominated by the Local Government Board on the application of either the Corporation or the annuitant. And the Corporation may, with the sanction of the Local Government Board, borrow at interest, on the security of the consolidated fund and consolidated rate, and of the revenues of their gas undertaking, the amounts payable according to the award to be made by the arbitrator, or such part or parts thereof as the sinking fund then applicable for the purpose shall be insufficient to meet, together with all costs, charges, and expenses payable by the Corporation in respect, or arising out, of the arbitration, or the redemption of the annuities. [*Parliamentary Agents: Messrs. Baker and Co.*]

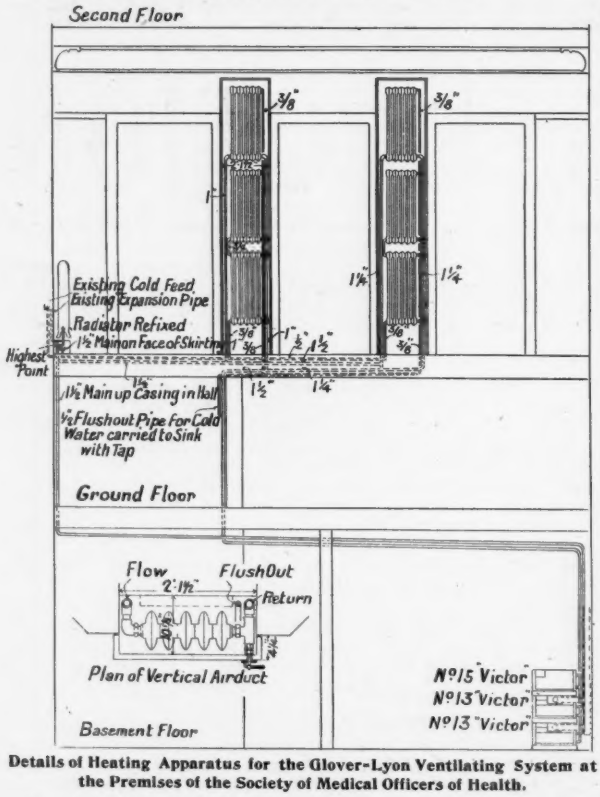
In the Rhondda District Council Act, a stand-by clause appears for the protection of the Gas Department. The terms, following those of the Mountain Ash clause granted in 1909, are as follows: "Notwithstanding anything contained in the Gas-Works Clauses Act, 1871, or any other Act, a person shall not be entitled to demand from the Council a supply, or the continuance of a supply, of gas for premises having a supply of gas from an installation other than that of the Council, unless he shall have previously agreed to pay the Council such minimum annual sum as will give to them a reasonable return on the capital expenditure and standing charges incurred by them to meet the possible maximum demand for those premises; and the minimum annual sum to be so paid shall be determined, in default of agreement, by arbitration in manner provided by the Arbitration Act, 1889." [*Parliamentary Agents: Messrs. Torr and Co.*]

Opening of Gas-Works at Maltby.—Works erected at Hellaby Bridge for the Maltby and Bramley Gas Company, Limited, were formally opened last Wednesday by Lady Mabel Smith; and that night 500 houses in the district were illuminated with gas. Some particulars of the undertaking (to which Mr. John H. Brearley, of Longwood, is acting as Consulting Engineer), and of the opening ceremony, will be given in next week's "Journal."

FROM ELECTRICITY TO GAS

At the Premises of the Society of Medical Officers of Health.

If there is a scientific and professional Society that in its collective capacity ought to know what, from the health standpoint, is best in the way of lighting and heating, that Society is surely the one composed of medical officers of health. Their offices, demonstration, and exhibition rooms are situated at No. 1, Upper Montague Street, Russell Square, W.C.; and there (we have the authority of Mr. W. A. Lawton, the Secretary of the Society, for saying) they have for some years been using the electric light, with the result that, on meeting nights, the rooms became stuffy and unbearable, and though, in the demonstration room, eight metallic filament lamps were used, the members used to complain that they could not see to read in the parts of the room farthest from the lights. The offices, demonstration room, and exhibition rooms have been lately redecorated; and it was decided that simultaneously hygienic conditions should be established in the meeting room by means of gas lighting and heating. Members of the Society prefer in winter time to avoid, whenever possible, breathing London air in an unpurified state; and they then like to have it delivered warmed into their meeting room. They have a fancy, too, for having their rooms well lighted and ventilated; and, in short, they desire to be an example to others. There we have the proposition they set the Gaslight and Coke Company. Well lighted and ventilated rooms—a plentiful supply of fresh air, filtered and warmed, and the warming to be subject to rapid regulation. The Company have carried out the work; and last Thursday there was a demonstration to show how efficiently the whole installation answers requirements. It proves how gas can, in places where people gather together at night time, be employed to ensure the maintenance of the hygienic conditions; and the example, endorsed by the professional position and weight of the medical officers, is going to be an influential one.



Details of Heating Apparatus for the Glover-Lyon Ventilating System at the Premises of the Society of Medical Officers of Health.

In the first place, as being the chief part of the new installation, reference may be made to the warming and ventilating arrangements for the meeting and demonstration room of the Society. Description should be prefaced by the information that the room is superficially 24 feet square, and 13 feet high; and its cubical capacity is therefore about 7500 feet. In this room on meeting nights, there are at times as many as 150 members assembled. Now for the heating of the apartments, the Society asked for something that approached an ideal system. The electricians said "Put in electric radiators and fans." The medical officers shivered at the notion of the thing; and the result was that the Gaslight and Coke Company submitted a scheme which has been carried into effect—the work, so far as the air warming is concerned, having been carried out for the Company by Mr. Thomas Potterton, of Balham. In the basement of the premises, there has been fixed a battery of three gas-heated boilers—two No. 13 pattern, and one No. 15 pattern—all connected to a water flow and return; so that three or two boilers, or one, can be used at will, and according to the passing need. These boilers consume 240 cubic feet of gas per hour when all three are engaged at full capacity, or 80 cubic feet each. The system of flow-and-return in the building will be best seen by the drawing accompanying this article. Hot water is first supplied to a radiator fixed just inside the door of the meeting room; and the position of this is such that, when it is in use, any air passing in by the door cannot fail to be warmed, and thus draughts are prevented. But this radiator can be cut out of the circuit, as can the others to which allusion has to be made; so that regulation and control are found from beginning to end of the system. Now in this room there are three large windows facing Russell Square; and between these windows, there is a space which looks like part of the solid wall, but which in reality is hollow. These hollow spaces (or enclosures we will call them) came in very handily in designing the scheme. In each of the enclosures are mounted, one above the other, three radiators, with the hot-water flow connected so that it feeds into the top one, and then passes downwards through the battery of three. Here we have what may be looked upon as a closed circuit—the only water that is really used up being the small quantity that is evaporated; and to compensate for this, there is a little cold feed into the foot of each radiator.

Now as each radiator possesses 25 square feet of heating surface, and there are three radiators in each enclosure, and two enclosures, there is in all 150 square feet of heating surface supplied by them. These enclosures in effect form shafts, at the foot of each of which there is a 12-inch electric fan, capable of passing 2500 cubic feet of air per minute, or 5000 cubic feet the two. But owing to friction in passing over the radiators and through the diffusing arrangement (to be presently referred to), it is calculated that 3400 cubic feet of air are passed per minute. In being drawn in from the outside by the fans, the air is first filtered; and passing over the radiators is warmed—regulation being effected by externally-operated valves which put the radiators in or out of circuit as required. We have got the warm air into this shaft; and the distributing arrangement of Dr. Glover-Lyon, who is a member of the Society of Medical Officers of Health, comes into play. This is in the form of a duct running across the room at ceiling-level, and containing closely-cut narrow slits on the front of the casing, through which slits warmed fresh air is driven, and so is diffused through the room. On the opposite side of the room, also near ceiling-level, there is a 2-feet fan (with an exhausting capacity of 4000 cubic feet per minute) which extracts the air vitiated by respiration, and sends it through an adjoining room into the open.

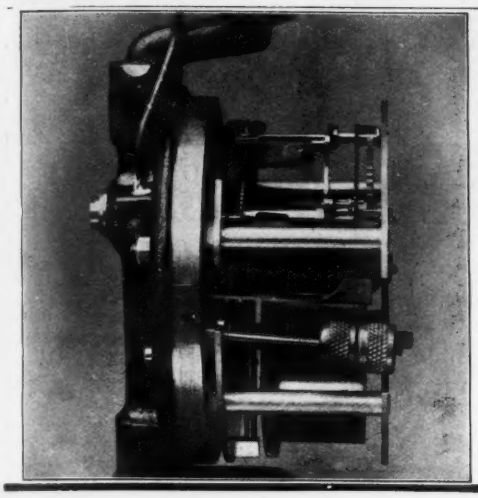
We have spoken of the regulation and control that are afforded by cutting out of circuit as many of the radiators as is thought requisite. But supposing the room were allowed to become too hot, the mere cutting out of the radiators would not immediately produce any appreciable diminution of temperature, seeing that the radiators would retain their heat for a considerable time. To provide, therefore, for a more rapid cooling than is to be obtained by cutting radiators out of circuit, arrangements are made for drawing off the hot water, and passing it into a sink in the basement. In this way, the radiators cut out would be almost immediately cooled. In addition to this system of supplying fresh, warmed, purified air, there is an alternative or supplementary means of heating in a Wright 21-inch "Salon" gas-fire.

The fans described are not the only means of ventilating. Personal experience goes farther than all the bare assertion that one finds in electrical advertising literature. The Society of Medical Officers can attest, from experience in their meeting room, that the electric light is of no use whatever for aiding ventilation. They have therefore had introduced a five-light inverted ventilating-lamp connected with an outlet duct. The lamp consumes 18 to 20 cubic feet of gas per hour; and therefore the cost for gas is less than ¼d. per hour. It is fitted with a figured, frosted globe and screen; and by it there is diffused throughout the meeting room a soft light. The control of the lamp is by a tap near the door, at the side of which tap there is provided a bye-pass supply for a pilot light in the lamp. This answers splendidly. The Committee of the Society, their Secretary informs us, are gratified with the pleasant conditions that now exist, and which did not obtain before; and though nothing can yet be said about cost (Mr. Lawton has already had inquiries from other Societies as to expenses), the experience so far satisfies that the system adopted will be an economical and healthy means of lighting and heating the place.

Above the meeting room are two rooms for exhibition purposes; and these are also now lighted by inverted gas-lamps, though electricity was used before—lighting and extinguishing being by the Telephos switch. The electric fittings have been left up, so that a contrast of the efficiencies of the two forms of lighting can be made. Comparisons are said to be odious; and certainly to electricians a demonstration of the contrast here might be regarded as very offensive.

Passing through the exhibition rooms, it was observed by our representative that the "Normandy" distiller is on view, by which pure water is obtained by generating steam by the burning of gas. Allusion was made to this contrivance in dealing with the Gas Companies' joint exhibit at the Japan-British Exhibition. Another exhibit is a surgical gas-bracket by Messrs. Best and Lloyd. In connection with this, an incandescent gas-burner is employed; the light being magnified, and capable of being directed on to an object at any angle.

The lecture list of the London Institution for the session 1910-11 includes one by Professor Vivian B. Lewes on "Smoke and its Prevention."



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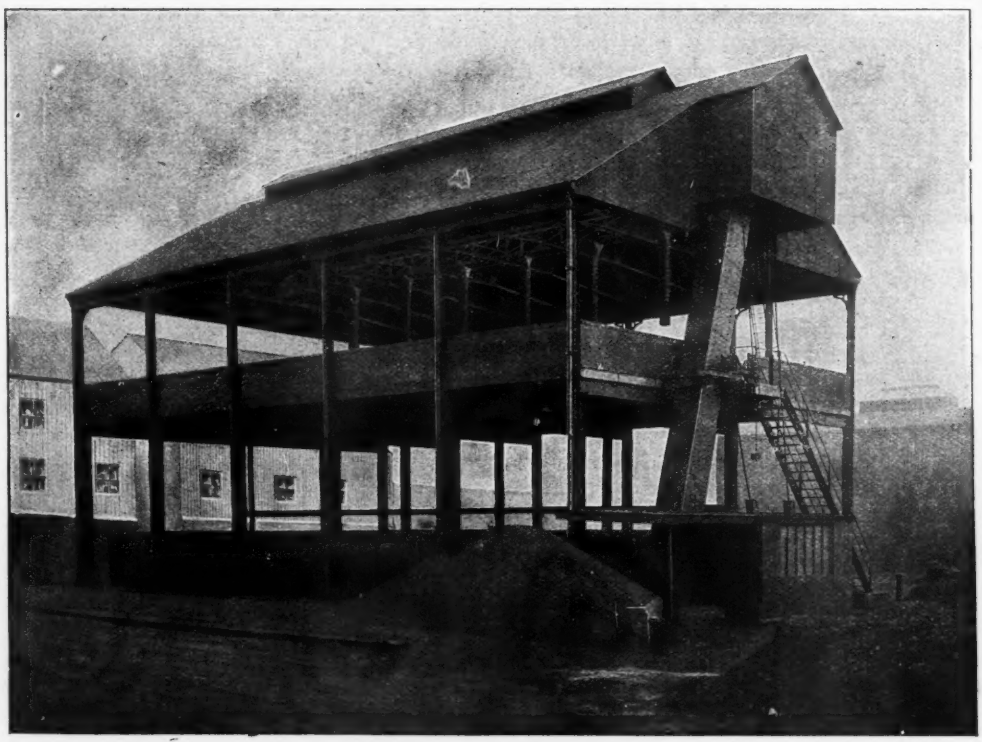

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3. All Designs must be at the Palatine Works, Warrington, not later than the Evening of Wednesday, November 30th, 1910.
4. The Wrappings or Envelopes in which the Designs are enclosed must be marked "Geyser Competition."
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Read the Pamphlet carefully so that no errors or inaccuracies enter into your work.

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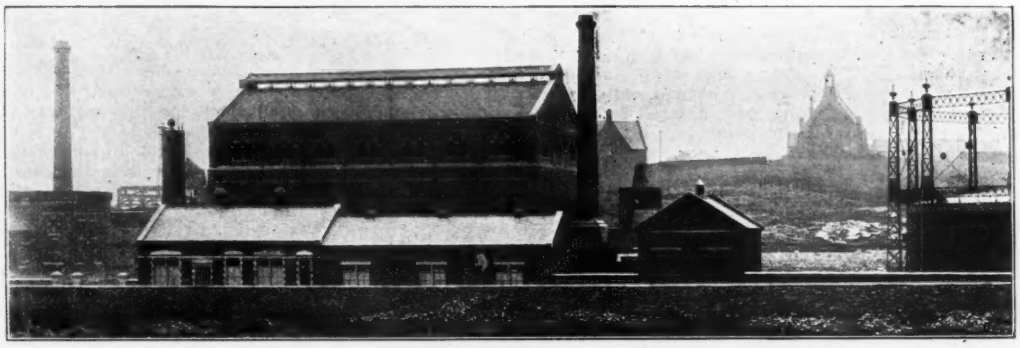
NEW GAS-WORKS FOR PADIHAM TO BE INAUGURATED TO-MORROW.



General View of the New Gas-Works of the Padiham Urban District Council.

[Showing from the left Boiler-House and Chimney, Retort-House, Coke Elevator and Hopper, and Offices, Stores, Meter-House, and Gasholder.]

THE first gas-works in Padiham were erected in 1846, by the Padiham Gaslight and Coke Company; the capital value being £4000. At a parish meeting the same year, the Lighting and Watching Act was adopted. Inspectors were appointed for part of the parish; and sanction was given for £170 to be spent by the inspectors in fitting up the lamps for lighting the town with gas.

In 1876, the Padiham and Hapton Local Board obtained an Act of Parliament to acquire the undertaking of the Padiham Gaslight and Coke Company. At that time, the capital value stood at £12,928, divided into 2400 fully paid-up £5 shares and 464 shares on which £2 each only had been paid. The consideration was the granting to the shareholders of perpetual annuities, called the Padiham and Hapton Local Board Gas Annuities, commencing on the 31st of December, 1874, calculated in the aggregate at £1118 17s. 7d. per annum; to the holders of any one or more shares in the Company, a perpetual annuity of 8s. 6d. in respect of each £5 share and 3s. 5d. in respect of each £2 share; the remaining £18 17s. 7d. was to be paid over to the Directors of the old Company and sold, and the proceeds divided between the shareholders. The consumption of gas during 1876 was about 17 million cubic feet.

In 1879, a contract was entered into with Messrs. James Kemp and Brother, of Read, for a supply of gas to their mill at Read; Messrs. Kemp agreeing to pay a portion of the cost of the work. In 1880, the consumption of gas having then increased to about 19 million cubic feet per annum, additional land was secured for the erection of new plant and buildings to meet the growing demands. With this acquisition, the land available for gas-making purposes was about 3157 square yards—2056 square yards being freehold. The site was situate right in the centre of the town.

Matters appear to have progressed much in the usual way until 1884, when an expert called in by the Council recommended that a new site be procured for gas-works purposes. Negotiations took up some considerable time, as it was not until 1887 that the site upon which the new works have been erected was secured. During the same year, the first lift of the existing gasholder with tank was erected to the design of Mr. Thomas Newbigging.

In 1896, the consumption of gas having increased to 41 million cubic feet per annum, the then Manager recommended to the Council the desirability of erecting new works on the land already provided. An engineer was appointed, and a scheme submitted to the Council at an estimated cost of £26,000. Differences of opinion as to the wisdom of spending so much money existed among members of the Council; and with other public works necessitating urgent attention, the question was deferred.

Considerable extensions were made to the old plant between then and the year 1907. At this time, the consumption of gas having risen to nearly 70 million cubic feet per annum, the Council again took into consideration the question of constructing the new works, and decided to add an additional lift to the gasholder situate on the new site. The contract for this work was let to Messrs. Newton, Chambers, and Co., in May, 1908; the work being completed by the end of August the same year.

In the meantime, the present Engineer received instructions to prepare a scheme, which was accepted by the Council, and a Bill, which ultimately became the Padiham Urban District Council Act, 1908, was promoted in Parliament in the session of 1908.

The following is a summary of the principal provisions contained in the Act relative to gas:

Extends the limits of supply by including the townships of Sabden, Read, and Simonstone.

Authorizes the purchase of the mains and services of the Read Parish Council.

Enables the Council to differentiate the charge for gas supplied inside and outside the urban district.

Grants the Council power to redeem by compulsory purchase the gas annuities not redeemed by Jan. 1, 1938.

Makes provision for the erection of the new works and for distribution purposes.

THE SITE.

The extent of the land available for gas-works purposes is some 16,560 square yards adjoining the Lancashire and Yorkshire Railway, and no doubt will meet the requirements for some considerable time. From a gas engineer's point of view, the site is an exceptionally good one, though the difficulties which had to be faced, and which will be dealt with later, made the site, from a constructional point of view, an expensive one.

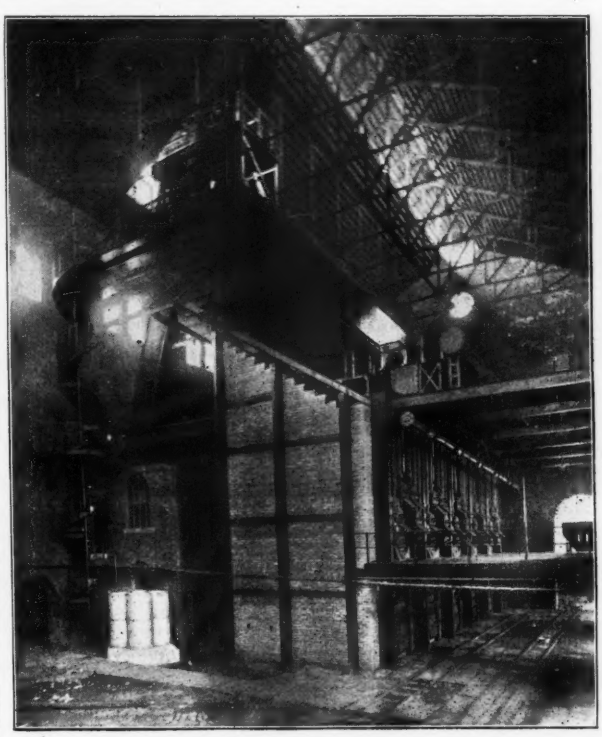
To take full advantage of the railway, it was decided to construct the works on two levels; the lower level being 15 feet below the higher or railway level. Some 20,000 cubic yards of earth has been excavated and removed; ample room being found for the excavated material in the levelling up of the Council's land adjoining the works. A strong retaining wall, constructed with local stone, supports the higher level, and forms the lower part of the coal-store.

Several important points had to be kept in view when designing the works; the principal ones being: Coal had been taken from beneath part of the site; the possibility of property being erected in the future on the land abutting on two sides of the site; and the existence of the gasholder already on the site. It was only after many months of careful consideration and work that the present scheme was submitted to the Council for their approval.

The carrying out to the full extent of the scheme will ultimately result in enabling the production of a million cubic feet of gas per diem, though the present provision is only for half-a-million cubic feet per diem.

GENERAL ARRANGEMENT.

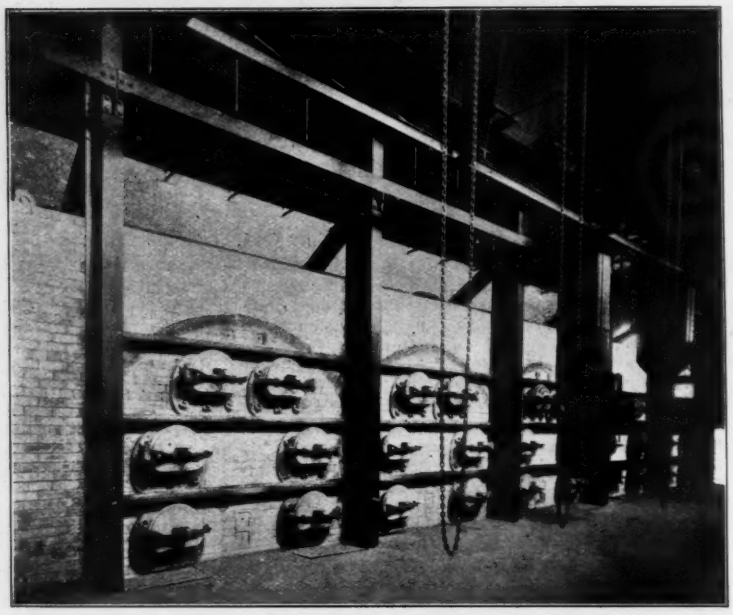
In arranging the buildings and plant, the primary object was that, as far as possible, advantage should be taken of the higher



A General View of the Carbonizing Installation.

level for dealing with the coal, coke, oxide, tar, sulphate, and other matters requiring railway facilities. In short, it was decided that all material requiring handling should be handled downwards, and not upwards, as was the case on the old works. The higher level contains the purifiers, sulphate plant, and weigh office for coal, along with overhead tar-tank placed high enough for the tar to gravitate into the railway-waggons—the tar being pumped into this tank from the storage tank situate on the lower level. The lower level contains the retort-house and coal-store, the condensing, washing, and scrubbing plants, boilers, exhauster and compressor houses, offices, stores, workshops, and meter and governor house, &c.

The buildings have been arranged in as open a manner as possible without isolating any building in out-of-the-way places. The plant is well grouped together, without being congested; the whole being constructed with economy, but still at the same time with due regard to appearance and efficiency. The buildings are all constructed with Accrington brick, relieved with Yorkshire stone; and uniformity of design has been observed throughout the works.



A View on the Charging-Stage.

Entrance, Offices, Stores, &c.

The entrance to the works is from Park Road, being situate between the offices, stores, and meter-house on one side, and the workshops, mess-rooms, &c., on the other side.

The main entrance is 12 feet wide, and the side entrance 4 feet wide. The gates are of wrought iron, of a plain, neat design, hung to massive pillars of Yorkshire stone.

The entrance to the offices is distinct from the works entrance. This block of buildings, upon which the general design has been relieved somewhat, comprise: The weigh office, inquiry office, manager's office, photometer-room, test-room, laboratory, and lavatories; the rooms being situate on the ground floor. The corridors which divide the rooms are of ample width and height; being tiled up to dado height, and plastered above to the ceiling. The entrance is formed with a suitable vestibule, inside of which is the inquiry window; the latter enabling complaints and other matters to be dealt with without necessitating access to the offices.

The Discharging Side of the Bench.

The laboratory and test-room are tiled and plastered, as previously mentioned, and face Park Road; and when completed they will be equipped with the most modern apparatus, and will no doubt prove a valuable acquisition to the plant. The other rooms which face the works are lofty and well-lighted, and are fitted with every conceivable convenience. Special attention has been paid to the ventilation of this block of buildings; and the heating will be by gas-radiators.

Adjoining the offices, and in direct communication therewith, are the stores. These comprise three lofty rooms, each 20 feet square, well furnished and equipped; and they have been designed with due regard to keeping a strict watch and account of stores. The blacksmiths' and fitting shops are each 20 feet square, being lofty and well-lighted; and adjoining these are the mess-room, bath-room, and lavatory. Special attention has been paid with a view to ensuring the comfort of the workmen; the rooms being lined with enamel brick and fitted up with suitable lockers, wash-basins, and bath. It is hoped that the men will show their appreciation of the efforts made to secure their comfort, by the frequent using of the bath, &c., provided.

Retort-House, Coal-Store, and Carbonizing Plant.

Naturally, it was an anxious time when the type of retort which should be adopted was under consideration. No undue haste occurred in this matter. In fact, months were spent observing results of different types of retorts and inspecting recently constructed installations before it was decided to adopt the present system. It is not the intention here to discuss the relative merits of any particular system. Suffice it to say that what has been installed, having regard to all the conditions, is, it is ventured to state, the most suited to the requirements.

The retort-house, which occupies the centre of the site fronting the main entrance, is 115 feet in length, 60 feet in width, and 52 feet in height up to the eaves; the house having been taken up sufficiently high to contain any type of setting should it, on future consideration, be desired. The lighting and ventilation of the house have received full consideration.

The house is constructed with Accrington engineering bricks; the plinths, oversailing, and base courses to the panels, key-stones, springers, corbel, &c., being in Yorkshire stone. The roof is of substantial design and contains fourteen principals, with ventilator running the full length of the roof; the slates being secured to the angle purlins with lead nails.

It will be remembered that mention was made of the site being an expensive one from a constructional point of view. This chiefly applies to the retort-house, coal-store, and carbonizing plant. The spot selected for these structures turned out to be a huge pocket of what might be best termed as "Jelly Sand." After careful consideration, having regard to the importance of good foundation work for this part of the plant, it was decided to entirely remove the sand. This necessitated excavating to a depth of from 5 feet at one end of the house to 15 feet at the other end; and at that depth a good bottom was secured on blue clay. The method of constructing the foundations was as follows: First of all, a 12-inch bed of concrete was laid; then the space was filled up to within 2 feet of the ground line in the case of the retort-bench, and 1 foot in the case of the house walls, with local rock quarried as large as could be conveniently conveyed to the site; then another layer of concrete to within 6 inches of the ground line, to receive the brick footings. Concrete has not been spared throughout the construction of the works; and this branch of the building work forms one of its chief features.

The retort-house has been designed to contain nine settings of six retorts on the inclined principle; but only five settings have been erected. The retorts are 20 feet long, and taper from 20 in. by 15 in. ⏛ at the charging end to 24 in. by 15 in. ⏛ at the discharging end.

The main arches of the bench are built with specially constructed bricks, so that the joints of the arches are vertical, to

ensure the weight of the arch and backing going evenly over the division walls and preventing any undue thrust on the front of the bench.

The gas is taken off from the bottom end of the retort and the hydraulic. Foul and tar mains are erected between the front of the bench and the house wall—thus being quite clear of the bench itself. An 18-inch foul-main is carried to one end of the retort-house and connected to two of Braddock's retort-house governors fitted with suitable bye-pass and gantry round the governors. The foul-main is then conducted along the side and end walls of the house to the condensers. An 8-inch tar-main is carried underneath the hydraulic main, and connected to the steel tar-tower at the end of the bench.

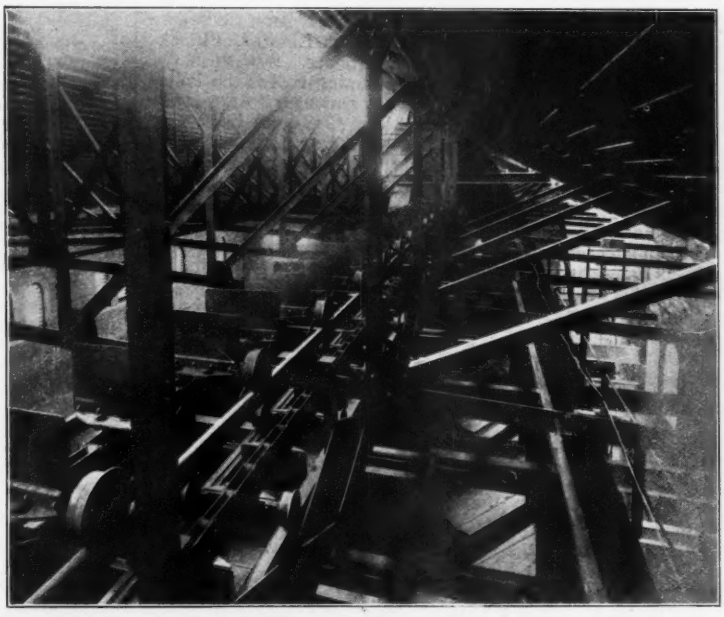
The drawing and charging floors are formed with steel girders and concrete arches covered with "Nori" Accrington paving bricks, making a firm, substantial floor.

The coal-handling plant is arranged to receive coal from the store and deliver into a battery of storage hoppers erected over the charging end of the bench, and capable of holding 100 tons, or 20 tons per bed. Underneath the hoppers are fixed the combined measuring chambers and shoots—one to charge each tier of retorts.

The coal-handling machinery consists of the coal-breaker, erected in a cast-iron tank, which forms the breaker-pit; the coal being fed into the breaker by a jigging feed arrangement. After passing through the breaker, the coal is fed into an elevator, which in turn delivers to a push-plate conveyor fixed over the hoppers. This plant, along with the coal-handling plant, is driven by a gas-engine, situate in the engine-house between the back of the retort-bench and coal-stores.

The coke plant is fixed outside the retort-house, and consists of an elevator delivering into a storage hopper erected on the higher level. A large gantry has been formed outside the end of the retort-house; so that the coke can be tipped from the gantry in the store-yard to a depth of 10 feet without cost of stacking, or can be tipped from this platform into the elevator when required to feed the storage hopper. On the ground level, a line of rails has been fixed for receiving the coke whan discharged from the shoots fixed in the drawing floor. These rails are connected up to the elevator on this level also, so that the coke can be elevated from either level. The storage hopper is fitted with shoots and operating gear for delivering the coke as it is required into the carts or waggons.

Suitable clutch gear is arranged for putting in or out of action any part of the plant previously referred to. The special features of the installation are the strong manner in which the bench is braced, and the arrangement of staircases and platforms which makes the whole of the plant easily accessible.



The Coal Conveyor and Elevator Head.

A View in the Subway.

Coal-Stores.

Running parallel the full length of the retort-house is the coal-store, which is 25 feet wide and 32 feet in height from the lower level to the eaves; the store having a tipping capacity of about 2000 tons. After about two years' negotiations with the Railway Company, fairly satisfactory provision has been made for dealing with the coal. Owing to local conditions, the cost of constructing a railway siding into the works made this means of bringing in the coal prohibitive, so that it was decided to put down a light railway. The Railway Company having set aside in their goods yard about twelve waggons' length of siding accommodation for the department's use, a 2-feet gauge railway was laid alongside, and continued into the coal-store. The method of bringing in the coal is with light tipping-waggons built to contain about 12 cwt.; and the rails being laid down with a suitable fall into the store, little difficulty is experienced in pushing the waggons into the store. The railway is also continued through the store to the coke-hopper, so that coke can be taken back on the return journey to the railway waggons in the same waggons that bring the coal. This method, it is thought, will prove to be very economical in use, and certainly has been economical in construction.

The whole of the carbonizing installation, coal and coke handling plant, retort-house and coal-store roofs, with the light railway accommodation, was placed in the hands of Messrs. Drakes Limited, of Halifax. The completed scheme is in entire keeping with the firm's reputation for work of this class, and has, it is ventured to state, given the greatest satisfaction to all concerned.

Retort-Chimney.

This is situate at the southern gable of the retort-house, and goes up to a height of 90 feet from the ground-line. It has an internal diameter at the base of 4 ft. 3 in., tapering to 2 ft. 9 in. at top. The shell is circular, with a batter of 2½ inches in 10 feet; the base of the chimney being square and relieved with Yorkshire stone. A 4½-inch fire-brick lining is carried to the top of the chimney, with a 2-inch cavity between this and the outer wall; the lining being arranged so that every 20 feet of the height is supported on the outer wall. The cap is formed with moulded terra-cotta blocks surmounted with a cast-iron plate secured with copper dowels.

Condensers.

The condensers, which have been removed from the old works, comprise eight columns, 22 ft. 6 in. high; the outer tubes being 2 ft. 8 in. in diameter and the inner ones 1 ft. 10 in. in diameter. Four of the columns were erected in 1887 by Messrs. R. & J. Dempster, Limited, and the others at a later date. Being of the annular type and in satisfactory condition, they are eminently suitable for the new works, and have the advantage of having suitable connections, which have been refixed as far as possible.

Boiler and Exhauster Houses.

The boiler, exhauster, and compressor houses form one complete block of buildings situate on the lower level between the northern gable of the retort-house and the railway; a passage 10 feet wide being left between the back of the buildings and the railway wall for the purpose of connecting up the two levels at this end of the works.

The boiler-house walls are carried up to a height of 26 feet to support the overhead water-tank, erected by Messrs. R. & J. Dempster, which has a capacity of about 25,000 gallons; the tank being sufficiently high to ensure a good supply of water on the higher level. The water is pumped from the River Calder by an Evans pump situate in the compressor-house.

The exhauster and compressor houses are lofty, well-ventilated buildings; the walls being covered with ivory white tile relieved at the skirting dado and frieze in light brown and yellow. The ceilings are panelled, and formed with Pensacola pitch-pine. The floors are suitably tiled; and ample provision has been made for ready access to the connections.

Boilers.

The boiler-house contains two Lancashire boilers, 18 feet by 6 feet, constructed by Messrs. Yates and Thom, Limited, of Blackburn, and fitted with Wilton's patent furnaces. Situate in the corner between the boiler-house and retaining wall is the boiler chimney, which is constructed in a similar manner to the retort chimney, with the exception that it has not the square base.

Exhausters and Compressors.

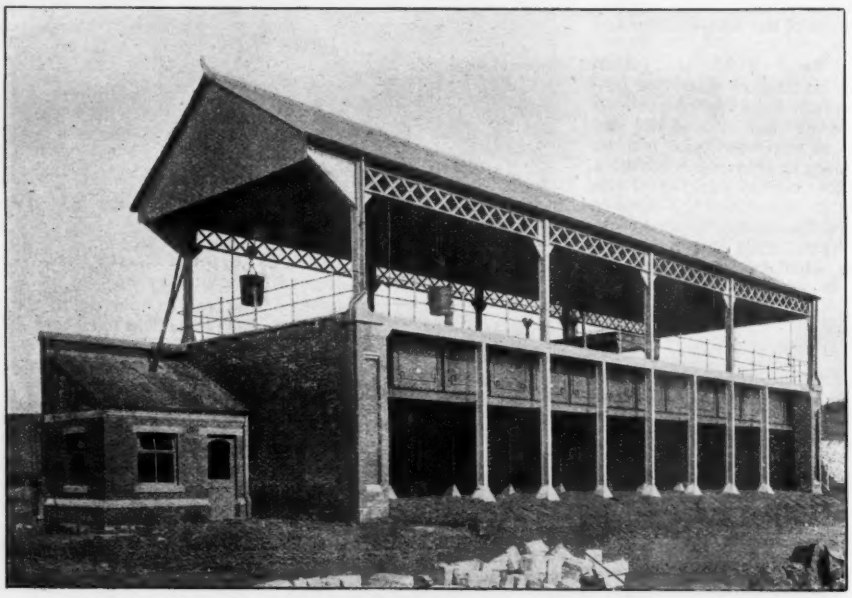
The exhauster-house contains a 30,000 cubic feet per hour exhauster, supplied by Messrs. George Waller and Sons, Limited, and one 20,000 cubic feet per hour exhauster supplied by the Bryan Donkin Company, Limited. The last-mentioned exhauster has been transferred from the old works, where it was erected in 1898. In this house is fixed the marble tablet commemorating the opening of the new gas-works.

The compressor-house contains the high-pressure plant for supplying Sabden, the township previously referred to. The compressors, which are in duplicate, were supplied by the Bryan Donkin Company, Limited. They are capable of delivering 10,000 cubic feet of gas per hour into Sabden, through about 5000 yards of 3-inch Mannesmann tubing, under a pressure of 10 lbs. to the square inch. The gas is governed at the entrance to the township with Reynolds governors in duplicate. This plant, which has been in operation since February last, is giving the greatest satisfaction, and certainly accomplishes all that the makers claim for it.

Washing and Scrubbing Plant.

This plant is situate between the northern gable of the retort-house and the front of the boiler-house; being well protected from the weather on three sides. The Livesey washer, supplied by Messrs. R. & J. Dempster, Limited, is capable of dealing with 500,000 cubic feet per diem, and was erected on the old works in 1906. The first portion of the tower-scrubber, 30 feet high and 8 feet in diameter, was erected on the old works the same year. This has now been extended to a height of 50 feet, making it ample for present use, and leaving a satisfactory margin for future requirements.

The scrubber is fitted with a liquor turbine at the top, with the usual distributing-pipes, and is provided with 5 inch by $\frac{3}{8}$ inch boards having $\frac{3}{8}$-inch space. The boards are supported every 5 feet with strong framing, which prevents buckling; sufficient room being left between the layers opposite the manholes for cleaning-out purposes. The effectiveness of this system is shown by the fact that practically every board was removed and refixed without breakage. The scrubber, which is of Messrs. Dempster's usual ornamental type, and has planed joints throughout, offered



Purifier Installation.

no difficulties in its removal and re-erection. The rotary scrubber, supplied by Messrs. W. C. Holmes and Co., is capable of dealing with 500,000 cubic feet per diem. Erected on the old works in 1898, it is still in excellent condition, and will form a useful adjunct to the new works.

Purifiers.

The first section of the new plant to be erected was the purifiers. These were completed in November, 1908, and have been in use since that date; the gas being brought over from the old works by means of a 12-inch main, which will eventually be used as a distributing main. The purifiers are of the Green type, 22 ft. by 18 ft. by 5 ft., fixed in one continuous length; each purifier having two covers over openings 15 ft. by 8 ft. The boxes are erected upon a substantial iron structure; the wall around the back and ends being carried up to the top of the purifiers, the back wall answering the purpose of a boundary wall. The iron roof is carried on stanchions which extend from the ground level at the front of the structure, and from the walls along the back and ends. Considerable time and thought were expended in deciding as to the best method of operating the purifiers; and many installations were inspected before the present system was adopted.

The oxide is raised by means of friction hoists. These are driven by a gas-engine situate in the engine-house at the end of the structure. The covers are raised by means of a Hovey crane. This permits of the two covers being raised at one time, and carried perfectly level; and it can easily be operated by one man.

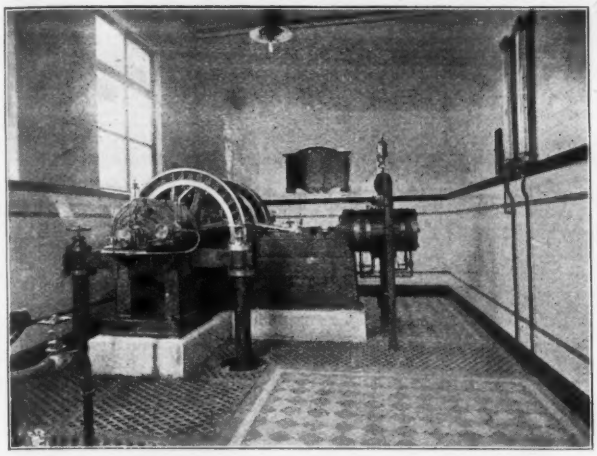
The rubber jointing material around the covers is stiffened by means of a continuous sunk iron bar, which is embedded in the rubber frame. This is secured to the kerb of the cover, which makes an exceedingly effective joint without any solution. Not the slightest trouble has been experienced with it, after nearly two years of actual work. The foul oxide is discharged from the purifiers on to the revivifying floor beneath, and is raised by means of iron skips, which are moved on the revivifying floor as required by means of flat-wheeled bogey-carriages. The purifiers are fitted with Spencer's hurdle-grids. At each end of the structure, openings are left for raising the skips by friction hoists; and they are rapidly lifted and run to the required position.

We are able to give the following figures relating to the purifying costs and the working of the plant. During the year ending March, 1910, seven changes took place; and the average quantity of gas passed each change was 10,043,000 cubic feet. The total cost of purification, including all labour in emptying, re-filling, and revivifying, gas, oil—in fact, everything carefully allotted to the plant—was £25 6s. This works out at an average of 0·08d. per 1000 cubic feet of gas made.

The oxide is loaned gratis from the Gas Purification Company. Four men will empty, clean out, and refill one of the purifiers during an ordinary working day of nine hours. This means handling in and out about 60 tons of oxide. The complete installation was carried out under a strict time penalty well within the specified time, and undoubtedly reflects the highest credit on the Contractors, Messrs. R. & J. Dempster, Limited.

Sulphate Plant.

Adjoining the purifiers is the sulphate-house, which is 30 feet long, 19 feet wide, and 17 feet in height from the ground line to the eaves; the plant being capable of dealing with 30 tons of liquor per day. The apparatus consists of rectangular shaped primary and secondary stills; the upper part of the former



Corner of Engine-Room, Showing High-Pressure Plant.

liberating the ammonia, while the lower part comprises the liming chamber. This is fitted with a patent injector which continually mixes the lime with the liquor, after which it flows through a lime interceptor into the secondary still. These are designed so that the entire side may be removed for cleaning without disturbing the fittings.

The lime-mixer has a lift and force pump with steam-driven agitator; the superheater being 2 feet in diameter and 6 feet in height, while the ammonia and foul gas pipes are 4 inches in diameter. The plant is fitted with the usual lime settling tanks, acid-supply tank, purifier, and condenser; the plant being arranged so that the devil liquor is released at such a temperature that it is deprived as far as possible of objectionable features.

The order for the plant was placed with Messrs. Dempster; but Taylor's saturator was embodied in the contract, and this, together with the whole of the lead work, was carried out by this firm.

Weigh Office.

This is situate alongside the entrance to the railway yard. The roof is formed by means of an overhead tank of 3500 gallons capacity, supplied by Messrs. Dempster. This will be used for loading up the tar into the railway-waggons or for local sales. Outside the office there is a 5-ton weighbridge.

Meter and Governor House.

This is situate on the lower level adjoining the stores and close to the gasholder, and contains a 30,000 cubic feet per hour station meter, transferred from the old works. When the scheme is completed, the two 14-inch governors (by Messrs. Parkinson and W. & B. Cowan, Limited), erected on the old works in 1906 and 1907, will be removed into this house.

A feature of this structure is the cellar, which will contain the whole of the connections and valves belonging to the meter and governors, arranged so that they can be operated from either the meter-house or the cellar floor levels.

Tar and Liquor Storage.

This is an underground brick tank situate on the lower level, divided into two compartments; the capacity being about 360 tons. The bricks for this work were specially selected. The whole are laid in cement, having the joints raked out to a depth of ½ inch; the surface then being covered with two coats of cement. The roof is formed with 12 inch by 6 inch steel joists and concrete arches.

Works Connections.

As far as possible, the connections have been placed above the ground level; and in no case is there a valve throughout the works situate underneath the ground. Another satisfactory feature is that, from retort to meter, there is not a single syphon to pump; past experience on the old works having ensured that this sometimes neglected part of the plant should receive more than average consideration. The whole of the condensed products are conducted into an inspection chamber, from which they overflow into the storage well.

Storage.

The storage comprises one gasholder on the new works, 100 feet in diameter by two 24-feet lifts, with a capacity of 360,000 cubic feet, and one bolder at the old works, 60 feet in diameter, by two 20-feet lifts having a capacity of 120,000 cubic feet—making a total storage of 480,000 cubic feet. Provision has been made for increasing the storage on the new works when required.

We trust that the future has in store for the enterprise shown by the Council and their Engineer (Mr. A. J. Harrison) a good measure of reward.

A SHOW-ROOM AT PUTNEY.

How attractive a gas show-room can be made is effectively demonstrated by the Wandsworth and Putney Gas Company in connection with premises of this character which have lately been opened by them for the mutual benefit of their consumers and themselves. But attractiveness, of course, is not everything. To fully serve its useful purpose, a show-room must be in a central position, where the greatest possible proportion of the residents of the locality will be bound to see without seeking it, and where those who are seeking will find it with the minimum of trouble and inconvenience to themselves. This point was naturally fully recognized by the Company, who for some time kept a sharp look-out for a suitable available spot in the most desirable business thoroughfare. The result was that at length they secured exactly what they wanted—a large corner building in the middle of Putney High Street, a famous shopping centre, with every facility of access. In the day time the extensive window space, and at night the big installation of outside lighting, persistently claim the attention of the passer-by. The least observant person could hardly pass by the place without noticing that it had been dedicated to gas. The Company rent the whole of the building; but at present they themselves occupy only the ground floor. Thus there is plenty of room for extension should it at any time be deemed advisable.

Calling on Mr. H. O. Carr, the Company's Engineer, a few days ago, a representative of the "Journal" was ushered into what at first glance appeared to more resemble a handsomely appointed drawing-room than a place designed for the exhibition of gas appliances. This, however, is merely a first impression. A second glance shows that, though in no respect overcrowded, there is a most representative assortment of gas-fires on the floor, and a number of beautifully selected fittings suspended from the ceiling and otherwise fixed. A visitor may enter to admire the interior; but the chances most certainly are that he (or she) will remain to select a gas-fire or some fittings. The room which is referred to here is the first (and the largest) of the series of three that are occupied by the Company. The decoration generally is carried out in the Adam style; and everything is in perfect harmony. Heavy green curtains at the back of the window match the carpet, while the ceiling is an exceptionally fine piece of work. The walls are panelled in a shade of Wedgwood blue, white, and gold (making the place look extremely light and cleanly); and palms and ferns are dotted about the room to add to its pleasing appearance. Messrs. Maple and Co. have done the furnishing well; and, in fact, everywhere the best of taste is displayed. The fire-place, with its rich overmantel and massive brass fender-seat, has in it an armour-bright dog-grate, fitted with a "Blenheim" fire. It might be thought that amid such luxurious surroundings the unfixed gas-fires, marked with both hiring-rates and net purchase prices, would seem out of place; but, on the contrary, they add to the attractiveness owing to many being of delicately coloured porcelain as well as black, and are certainly presented in the most pleasing of aspects. Even the figured tickets are made as attractive as possible; and, above all, as mentioned, there is no overcrowding. Of course, all the latest novelties are to be seen; and various fittings are provided with switches, so that they can be lighted-up for inspection by prospective purchasers. With regard to these fittings, it is unnecessary to say more than that the assortment is thoroughly representative of the latest and best designs; while the silk and beaded shades and glass globes and cylinders cover a wide range.

Stepping from the first room into the second, there are seen illustrations of the uses of gas in the bathroom and kitchen. A bath and wash-basin are fitted with hot and cold water; the means by which the former can be provided being demonstrated by various forms of water-heaters. Here there are to be found more gas-pendants—this time of a less expensive style, so that the wants of all classes of consumers may be adequately catered for; and there are also specimens of gas-irons, gas boiling-rings, coffee-roasters, &c. Leading out of this is the third room, in which are displayed gas-cookers of all sorts and sizes, in exactly the condition in which they are sent out to the consumers. Stores are arranged in bins round two sides of this room, from which they are entirely curtained off. In the centre there is an Edgar ceiling-light, which ventilates out into the open, by means of a flue running to the outer wall of the building.

In the extensive window space an effort has been made to show every useful gas appliance—a remark which is sufficient to enable one to understand the variety of the display. Mention may be particularly made of two beautiful oxidized silver standard gas-lamps, with silk beaded shades. There are also set out fires and cookers, muffle furnaces for art enamelling, a gas fire-lighter, a singeing burner, a painter's burning-off tool, and other things too numerous to name. In fact, a careful study of the window would form a liberal education in the multifarious uses to which gas can now be usefully applied.

The outside lighting is on such a generous scale that the premises are, without doubt, the finest lighted in Putney. At the

An Exterior View of the Wandsworth and Putney Gas Company's New Show-Room during Lighting Hours.

corner of the building there is a Keith high-pressure three-burner cluster inverted lamp, credited with a light of 4500-candle power, and round the sides there are eight single-burner lamps on the same system, each of a capacity of 1500-candle power. The lamps are believed to be fully up to their stated power, if not to even exceed it. The gas is supplied at 80 inches pressure by means of a compressor in the basement of the building; and so successful is the installation, that a neighbour has already applied to have two lamps run off the same supply. A pipe from the high-pressure main also runs through the two rear show-rooms, and to it are connected lamps of various types, which can thus be seen in operation when desired by visitors. In connection with this matter, it may be mentioned that the Company are supplying a line of shops at Earlsfield on the high-pressure system; and the demand for the light has so grown, that it is in a fair way to outstrip the capacity of the machinery so far put down.

Sufficient has been said here to justify us in congratulating, as we do, the Directors of the Wandsworth and Putney Gas Company on the excellent step which they have thus taken to assist the distribution side of their progressive undertaking—a step which can hardly fail to still further popularize the remarkably cheap gas supply which they offer to consumers. As a matter of fact, the first week's business has proved to be four times that of the old show-room within a minute's walk—but in a less important thoroughfare, and smaller premises.

An Interior View of the Wandsworth and Putney Gas Company's New Show-Room.

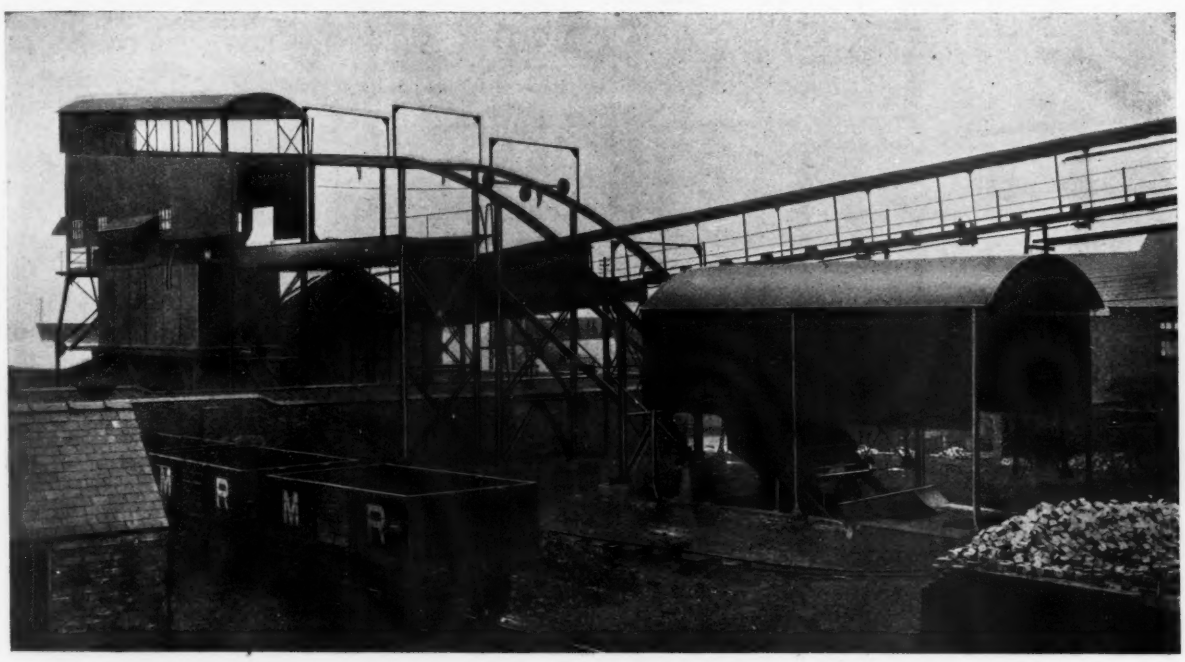
EXTENSIONS AT THE ILKESTON GAS-WORKS.

In the spring of 1907, the Ilkeston Corporation decided to adopt a scheme submitted to them by the Gas Committee for enlarging and modernizing their works, in accordance with plans prepared by the Gas Engineer, Mr. F. C. Humphrys. It included the acquisition of 9611 square yards of land (separated from the existing works by a public road), to be utilized for coal sidings and storage, and also for screening and loading coke and for general stores. The legal proceedings were somewhat complicated, and caused delay. Certain objections were raised by the Local Government Board; and two inquiries had to be held—the second on the 9th of March last year. The following July, however, the Corporation obtained a Provisional Order granting them power to use the new lands for the manufacture or storage of gas or residual products. Meanwhile, the engineering works were being pushed on as rapidly as possible; the following contracts having been arranged: Gasholder and tank, Messrs. C. & W. Walker, Donnington; retort-house and boundary wall, Mr. J. G. Short, Nottingham; compressor and pressure raiser, the Bryan Donkin Company, Chesterfield; governor and connections, the Gas-Meter Company, Oldham; stoking machinery, Messrs. Aldridge and Ranken, Bath; coal-conveying plant, standards, and generating plant, Messrs. Robert Dempster and Sons, Limited, Elland; power-house and coal-store, Mr. J. G. Short; siding, Mr. T. W. Ward, Sheffield; coke plant, Messrs. Robert Dempster and Sons, Limited; and weighing-machine, Messrs. Hodgson and Steale, Salford. Other contracts were entered into with the Midland Railway Company, for a connection between their line and the gas-works siding; with the Stanton Iron-Works Company, for cast-iron pipes; with the British Mannesmann Tube Company, for high-pressure steel tubes; with the Lead Wool Company, for jointing material.

With these preliminary observations, we proceed to give a description of the works.

Gasholder and Tank.

The gasholder is built on the spiral-guided system, on the most modern and improved lines. It has two lifts; but provision is made for a further lift to be added when additional storage is required. This would be the outer lift, and the present outer would then become the middle lift. The two lifts are 108 feet, and 110 ft. 6 in. diameter respectively, each being 25 ft. 6 in. deep; and when fully inflated they contain 453,000 cubic feet of gas. To guide the lifts in rising and falling, bulb-headed T-rails are fixed to the sides. They pass between rollers which are secured in strong carriages; these in turn being strongly bolted down to the top of the tank and to the top of the outer lift. The tank is of steel throughout, and is 115 feet in diameter and 26 feet deep. It has a capacity of 1,673,330 gallons of water, the weight of which is 7600 tons. In constructing it and the holder, 330 tons of steel were used; so that the total weight bearing on the concrete foundations is equal to 7930 tons. In joining the various parts of the structure together, upwards of 220,000 rivets were used, varying



View Showing the Feeding Platform and Inclined Track for the Travelling Hopper, also the Bridge over the Roadway and the Storage Hoppers.

from $\frac{7}{8}$ to $\frac{1}{4}$ inch in diameter. At the top of the tank a walk-around, formed of steel chequered plates, is fixed; access to it being gained from the ground by a steel ladder. From here the carriages at the top of the tank, and also those on the dip of the outer lift, can be attended to; the latter being accessible when the outer lift is landed in the tank. Ladders are carried up the sides of the holder, giving access to the crown.

Coal and Coke Handling Plant.

The coal-handling installation, supplied by Messrs. Robert Dempster and Sons, Limited, consists of an electrically-operated capstan for hauling full trucks over the receiving hopper and taking the empty waggons away. The coal, when discharged from the waggons, falls into the steel receiving hopper, and from this is delivered automatically by means of a sure-feed arrangement in regular quantities to the elevator. The elevator delivers the coal into an overhead push-plate conveyor, running the full length of the new coal-store, and arranged with outlets, so that the coal may be dropped into the store or be delivered through the end of the store on to the first band conveyor crossing over the public road already referred to, and delivering on to the second band conveyor skirting the private property alongside the gas-works, and delivering on to the end of the push-plate conveyor fixed over the coal-hoppers extending over the whole of the nine arches. These overhead hoppers are all fitted with Messrs. Aldridge and Ranken's patent automatic outlet-doors, working in conjunction with a Fiddes-Aldridge patent combined stoking-machine. The coal-handling plant is capable of delivering 20 tons per hour from the siding, either into the coal-store or into the overhead bunkers in the retort-house. All these conveyors, &c., are driven from an electric generating installation described later on.

In the new retort-house have been built nine arches, each 9 ft. 5 in. span and 20 feet through, each capable of receiving eight retorts 23 inches wide and 16 inches deep, of special ⌂ section, to suit the Fiddes-Aldridge stoking-machine. Six of these arches are fitted up complete with furnaces, mouthpieces, ascension-pipes, hydraulic mains, &c. Coal-hoppers are fitted up over the whole of the nine beds; the floor on the charging side being made for the full length of the house, and on the discharging side for five beds only—*i.e.*, one past the settings. This floor is laid 2 feet lower than the charging-floor, and is fitted with rails to enable ordinary coke-trucks to take coke from the bottom retorts. The settings are on Brooke's patent tubular regenerator system.

The whole of the gas is taken off from the discharging end of the retorts through 7-inch ascension-pipes into hydraulic mains 2 ft. 6 in. wide in the gas space, and with a 6-inch space which can be opened for cleaning purposes while gas making is in progress. The foul main and tar mains are laid over the whole of the nine arches; the former being fitted with an 8-inch retort-house governor, and the latter delivering into a tar-tower at the end of the bench. The coke is pushed from the retorts direct into coke-trucks running on the rails previously described. These rails are continued outside the house round to the coke-pit. The trucks are of Messrs. Dempster's patent side-door type, fitted with ball-bearing wheels, and running so lightly that one man can easily handle a truck when charged with the coke from two 20-feet retorts.

After leaving the retort-house, the trucks are run under coke-quenching sprays, and afterwards discharged on the ground or

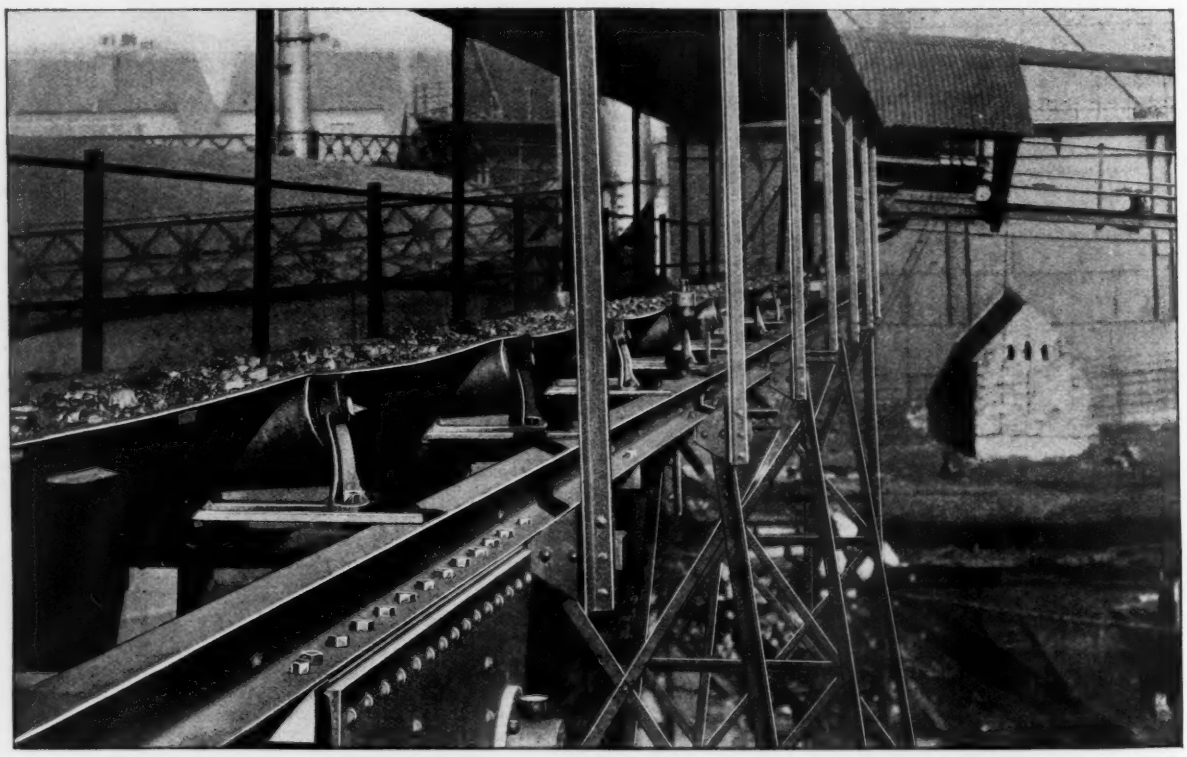
run over the coke-receiving pit, and emptied into a travelling hopper running on a track to the top of the screening plant. The bottom of this hopper is fitted with a quadrant outlet-door, with catches for engaging with striking gear, so that the discharge will be automatic at any required point on the track. The whole of the operations in connection with this hopper are controlled by a lever; the gear being so arranged that it is impossible for the attendant to start the winding gear in the wrong direction. In addition to this, there is an automatic shut-off both at the top and bottom of the track. The capacity of the hopper is about two tons, so that 10 to 15 tons per hour can easily be handled and delivered to the screening plant or to the stack in the coke yard. Over the screening plant is fixed a hopper, which receives coke direct from the travelling hopper. From this hopper coke is delivered in regular quantities by means of a feed device on to an impulse conveyor, which screens the coke and delivers it into hoppers below.

The motive power for the whole of the plant is obtained from two 22-kilowatt dynamos, compound wound, directly belt-driven from two "National" gas-engines of 42 H.P., with two switch-boards complete with voltmeters and ammeters, &c., and each being specially fitted with a reverse current breaker, so that both dynamos can be run separately or in parallel. From these dynamos separate circuits are laid to each motor as follows: (1) Motor for driving the capstan for hauling trucks in the siding; (2) motor for driving the elevator and push-plate conveyor in the coal-store; (3) motor for driving the first band conveyor, taking coal from the push-plate conveyor; (4) motor for driving the second band conveyor and push-plate delivering to the retort-house hoppers; (5) motor for driving the travelling coke-hopper up the inclined track; (6) motor for driving the impulse conveyor screen; and (7) motor for driving the Fiddes-Aldridge stoking-machine. In each case a starter is fixed in the most convenient position, close to the motor it actuates.

The electric plant is housed at the gable end of the retort-house, close by one of the main entrances to the works. The whole of the contract for the above work, with the exception of the stoking machinery and the buildings, was carried out by Messrs. Robert Dempster and Sons, Limited.

Gas-Compressing Plant.

The portion of the town of Ilkeston which is situated on the side of the hill farthest from the gas-works is supplied from a holder of a capacity of 30,000 cubic feet. Up to a short time ago, this holder was kept filled by means of an exhauster, driven by a gas-engine which drew gas from the mains and pumped it into the holder. This arrangement had several disadvantages. It necessitated a man being in constant attendance on the plant at the holder, which it was only possible to fill at certain hours, as the draught on the main when the exhauster was at work interfered with the supply to the consumers; and it was also necessary to raise pressure at the works while the holder was being filled.



Details of One of the Band Conveyors; Showing the Structural Work Supporting it and the Gangways.

All these difficulties have now been overcome, and many advantages gained, by the installation of a gas-compressor at the works, which is connected to the holder by 2½ miles of 3-inch Mannesmann steel tube, the joints of which are made with lead wool.

The method of working is for the man, who still lives near the holder, but who is now engaged at the gas-works, to note every morning the quantity of gas needed to fill the holder. The compressor is then started, and the required quantity is sent out; being measured by a rotary meter on the compressor outlet. By this arrangement an adequate supply of gas is assured to the district, however it may increase, as the holder can be filled at any time without interfering with the consumers. All the machinery is now at the gas-works, and it is no longer necessary for a man to be in attendance at the holder. There is at present no automatic arrangement for shutting off the holder when full; but this could easily be fitted any time if found necessary. The house at the holder is, however, in telephonic communication with the gas-works.

The compressing plant, which, as already mentioned, was supplied by the Bryan Donkin Company, Limited, of Chesterfield, consists of a rotary compressor, capable of passing 3500 cubic feet of gas per hour, coupled direct to a horizontal steam-engine on a base-plate. The engine is fitted with a Pickering governor, and the compressor with an excess pressure valve, which can be set to give any desired outlet pressure. The compressor is capable of pumping up to 3 lbs. per square inch; but the pressure required when filling the holder is generally about 20 inches of water. A rotary meter is fitted in the outlet main, and registers the quantity sent out to the holder. The whole arrangement is found to work with the utmost smoothness, and it gives no trouble.

Station Governor and Connections.

The governor is of the most improved self-acting and compensating type; the valve being of the cylindrical pattern, with parabolic openings, so arranged as to give a constant outlet pressure whatever draught there may be. The pressure is regulated by a special water-loading arrangement on the top of the bell, and is so arranged that any desired pressure can be obtained, which can be increased or decreased so gradually that the change is not perceptible in the mains. The bye-pass consists of six 16-inch improved internal rack-and-pinion slide-valves, and all the necessary pipe connections, together with a special 24-inch distributing-main. The valves are fitted with columns or standards, with polished bright hand-wheels and brass indicators. The old governor has been thoroughly overhauled, and works in connection with the new one, each having a separate district to control. By means of a special system of connections, each is capable of doing the work of the entire district.

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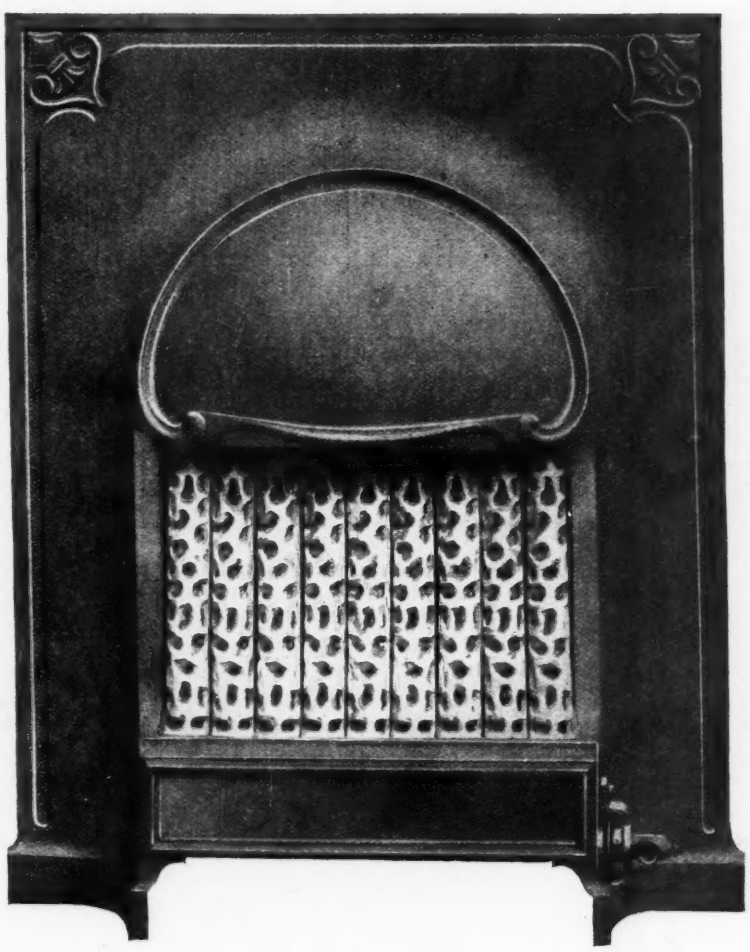

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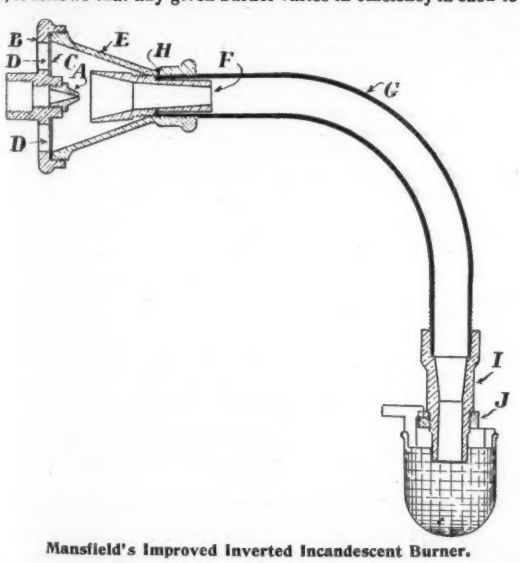
MANSFIELD'S IMPROVED INVERTED INCANDESCENT GAS-BURNER.

It will probably be remembered that early last year Mr. Alfred Mansfield, of the firm of Messrs. Mansfield and Sons, Limited, was appointed by the Corporation of Calcutta to confer with them on the subject of the public lighting of the city; and that shortly afterwards he made a report which appeared in the "JOURNAL" for the 9th of March. The result was the conclusion of a new contract with the Oriental Gas Company, and a reorganization of the public lighting service. Mr. Mansfield thereupon instituted inquiries with the view of obtaining burners suitable for the city of Calcutta; but he was unable to find one which would exactly meet the requirements of the authorities. These were that an inverted burner should be used, the gas pressure being 2 inches of water; that the consumption should range from 1 cubic foot to 4 cubic feet, according to the streets which had to be lighted; and that the burner should allow of incandescent lighting throughout the whole place, without having to resort to mixed flat-flame and incandescent lighting. Though the consumptions were in some cases to be very low, the efficiencies of the burners had to be high; and, after months of experiment, these have been arrived at, and at the same time great economies have also been effected.

Mr. Mansfield's new burners, which have been patented in all important countries, involve many new points, which consist essentially of the following: A nipple is used giving a definite supply of gas at any given pressure. There is a free air-way, which allows the force of gas to draw along with it whatever quantity of air is necessary for the burner. This is predetermined by a small tube or injector in the body of the burner. To avoid lighting-back, a mixing-tube of definite diameter and length is used; and at the end of this there is the usual nozzle orifice, together with the mantle holder. The positions of the mantles are decided in direct proportion to the diameter of the nozzle orifice. The length of the cone of the bunsen flame is arranged to be double that of the nozzle orifice, and the mantle three diameters of the outgoing nozzle from the end of it to the bottom of the mantle. A very large number of tests have been made with every available apparatus; and we are assured that the result is perfect, approaching 30 candles per cubic foot with a consumption as low as 2·2 cubic feet of gas per hour. Economy of gas is a great matter with lighting authorities; and when a burner can be obtained to give such high results as those mentioned, suppliers of gas have nothing to fear from Osram lamps, or anything else that can be put forward, especially when the same candle power can be repeated practically indefinitely—the only limitation being the quality of the mantles, the gas being always the same in calorific value.

Abstract of Patent Specification—No. 20,343; Aug. 31, 1910.

The invention has for its object "improvements in atmospheric burners for use with illuminating gas, and especially for mantles." The patentee remarks that a burner of definite dimensions will not work properly when used with different qualities and pressures of gas; to obtain the maximum of efficiency from any burner, it must be designed for the quality of gas as well as the pressure of the same with which it is used. A gas-burner of definite dimensions will not work properly when used with gas of a quality for which it was not originally designed; consequently, as the quality varies in nearly every town, it follows that any given burner varies in efficiency in each town.



Mansfield's Improved Inverted Incandescent Burner.

The burner consists essentially of a base plate, a nipple entering the base plate, a mixing-chamber at the back of the base plate, a gauze therein, an injector projecting from the chamber, a nozzle or burner proper, and a tube or connection connecting the nozzle with the conical orifice from the mixing-chamber.

As shown, the size of the nipple A governs the quantity of gas that has to be passed through the burner at the point of combustion, the diameter of the nozzle I regulates the required length of flame; and the height of the mantle support gives the amount of mantle surface to be exposed to the heating effect of the burning gas. By, therefore, screwing down the carrier J, the length of mantle exposed to the burning gas can be increased. Any consumption of gas can be arranged for—from ½ cubic foot an hour upwards to 5 cubic feet, with the same burner, by simply changing the nipple A, nozzle I, injector F, and mantle, the latter of which can be of the ordinary commercial type. By thus making the nipple, injector, and nozzle interchangeable (there being for each a considerable number of varieties), the "very highest efficiency for any kind of gas and any pressure can be secured." It is preferred to have the tube G arranged so that it can be screwed in and out a little by the adjusting connection H, so as to still further regulate it. But, as the patentee points out, "this is a comparatively small matter, as each tube is made of the right contour for best efficiency."

Attempts have, he continues, been previously made to obtain this result by providing regulating gas-nipples, and devices such as a hit-and-miss grid for controlling the primary air supply; but these methods have serious objections when used for such purposes as public lighting where the adjustment is frequently inadvertently altered by the lamp cleaners. "Consequently, in many places gas-burners are rapidly rendered useless by being choked with dust and insects which are drawn in with the primary air supply. They are also frequently of great annoyance owing to incomplete combustion, and consequent noisome smell."

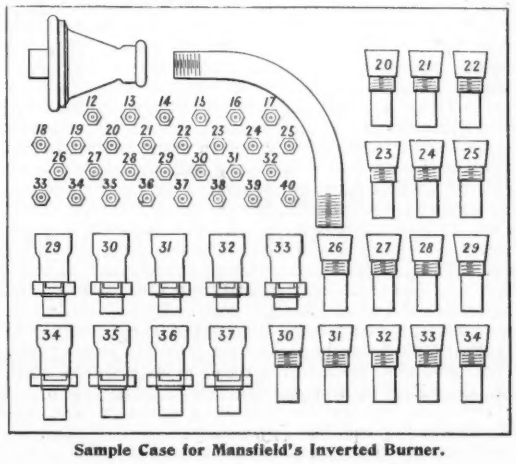
In order to prevent the gas from lighting back at the injector nipple, various forms of gauze and perforated cones have been introduced in the mixing-tubes of burners. These also rapidly become choked with insects and dust, and also by the corrosive action of impure gas. With gas-burners as at present constructed, the nozzle in which the gas burns is of definite diameter; and the consumption of gas by such a burner is always an unknown quantity. If the burner has been constructed to consume (say) 4 cubic feet per hour of one quality of gas, it will probably require 5 feet of a different quality of gas to work successfully.

By the present invention, it is possible to adapt the apparatus to any condition required for lighting and to any quality of gas. The inventor has found that the flame of the atmospheric burner when working at its best gives a clearly defined inner cone of unconsumed gas, which measures twice the diameter of the orifice from which the gaseous mixture is issued—that is to say, if a nozzle is fixed which has an issuing nozzle of 0·4 inch in diameter and after lighting the gas a measurement is taken from the end of the nozzle to the apex of the inner cone of the flame, this dimension should be 0·8 inch in length. Further, it is found that when used with an inverted mantle, the bottom of the mantle should be three diameters of the nozzle from the end of the latter to obtain the maximum efficiency. In the instance above mentioned, therefore, where the nozzle is 0·4 inch in internal diameter, the bottom of the mantle should be 1·2 inches from the end of the nozzle; and this can be regulated to a nicety by screwing up and down the carrier J.

When a nozzle of the desired aperture has been thus placed in position, the injector F is fitted into the chamber E; and the cone screwed up against the gauze C and the plate B. The gauze now prevents any insects and nearly all dust from entering the air-chamber at D. The connection H is screwed on to the air-chamber; and the requisite nozzle is adjusted in place. The mantle must be three times the internal diameter of the particular nozzle from the latter.

A little experience will show the operator exactly what alterations he should now make in the nipple, injector, and the nozzle—all these three being made of numerous sizes, each of which is interchangeable with the others. When, therefore, the operator comes to fix the burner, he first ascertains (from tables or otherwise) the size of injector F required for the particular purpose under consideration. A nipple which consumes the required quantity of gas at the regular pressure is selected; and experiments are tried with different sizes of nozzles until the proper size has been found to give a cone which has a length of twice the diameter of the nozzle. The burner so adjusted will give the maximum efficiency which can be obtained from the quality of gas available. It will also be found that as the burner is then correctly designed for the quality of gas, there is no danger of lighting-back, and no necessity for gauzes or other obstructions being placed in the mixing-tube or over the nipple.

We give below a diagram showing the box containing the necessary body, tube, nipples, and nozzles which Messrs. Mansfield use for the purpose of determining the correct burner for any kind of gas at any pressure.



Sample Case for Mansfield's Inverted Burner.

It will be noticed that the nipples are marked from 12 to 40. This represents the diameter of the hole in thousandths of an

inch. The injectors and nozzles are marked similarly; but in this case the measurements are in hundredths of an inch. This allows of each part having a definite relation to another. The consumption of gas is settled by the pressure and size of the nipple. The size of light and mantle is determined by the size of the nozzles; and the injectors settle the question of the quality of the mixture by the practical measuring of air in proportion to the quantity of gas sent forward by the nipple at whatever pressure is available. Messrs. Mansfield consider that the pressure should be 2 inches and upwards, as they find that no burner of the inverted type works well at less than this pressure.

POWER GAS AND ITS DEVELOPMENT.

A Lecture at the Sir John Cass Technical Institute.

In the well-equipped and commodious lecture-hall of the Sir John Cass Technical Institute, Jewry Street, Aldgate, E.C., there was delivered to a good audience on Monday evening of last week the inaugural lecture of a course of instruction in "Fuel." The lecturer was Mr. J. S. S. Brame (who is Lecturer on Fuel at the Institute); and he took for his subject on this occasion "Power Gas and its Development."

The chair was occupied by Professor F. Clowes, D.Sc., who, in his opening remarks, said that he had watched the progress of the Sir John Cass Institute with great interest. He felt sure, when he saw the manner in which the whole scheme was being supported, and the handsome resources which were at the command of the governing body, that the Institute would prove to be a highly successful one; and when his friend Dr. Charles A. Keane was appointed Principal, he was convinced that this success was still further guaranteed. The completeness of the equipment and the arrangements for scientific teaching were wonderful; but perhaps the most gratifying thing of all was the way in which students, who had been at work all day, would come to the Institute in the evening and devote themselves to the acquisition of knowledge—though when they looked at the names of the teachers, it could really cause no surprise that people should be willing to travel even long distances to hear such men and benefit by their instruction. The subject to be dealt with by the lecturer that evening was one of the greatest importance. One of the most uncomfortable thoughts that were forced upon them nowadays was that their fuel was not only being used in a reckless and random fashion, but in such a manner as to cause the very greatest nuisance. He need not speak to them of the inconvenience and loss which were occasioned by the smoke nuisance. It was a disgrace that such a nuisance still existed. The advance from the burning of raw, solid coal fuel to gaseous fuel, which was to be dealt with in the lecture, was a great step; and they must hope that some of the solid forms of fuel derived from coal would prove successful in assisting the development of the consumption of fuel economically and without causing nuisance. The use of fuel in an objectionable and an extravagant manner would be checked if they kept an account of the heat effect obtained by its consumption. This was done in many works, where the fuel was so burnt that the combustion was as perfect as possible, and the loss of heat was therefore minimized. They could only hope that progress on these lines would defer to a very considerable extent the time when they would find that the coal supplies were vanishing. An attempt was being made to do in England what was done elsewhere—pay for fuel at its heat-producing value. This, surely, was a step in the right direction. They bought other commodities on the basis of the value of the materials which they contained; and, of course, what they required in the fuel was its capacity for producing heat. They ought, under these circumstances, to know the heat value of the fuel they were using, and let its cost be assessed on this.

Mr. Brame then proceeded to deliver his lecture, which included descriptions (with the aid of lantern slides) of various forms of pressure and suction gas plants, and an outline of the general principles underlying the action of apparatus of this character. In opening, he remarked that the introduction of power gas would become a factor of great national importance in the very near future. Economy in coal consumption was one of the things they would be forced to face boldly before many years had elapsed. There could be no doubt that they had been extremely great spendthrifts in this matter. Of course, in some special industries it would be impracticable to economize in the use of coal for purposes for which it was required. For instance, in gas-works they must not expect any reduction in quantity, but rather the reverse. When, however, they came to blast-furnaces and coke-ovens, it would be seen that they had been absolutely lavish in the expenditure of the available heat units. By the introduction of big gas-engines, it was possible to utilize a large quantity of the heat units which formerly passed away in the waste gases. In coke-oven gas, also, there was a tremendous potential source of power. One English firm were saving £1000 per week on these lines; and there was an iron and steel works on the Continent where a fuel saving equal to £75,000 a year was effected.

Referring to the question of the present output of coal, the lecturer said the total coal production for 1909 was 263¾ million tons; and the annual home consumption some 180 million tons. It was difficult to estimate how this consumption was distributed; but it might be roughly computed that 45 million tons were utilized for power purposes, 20 millions for blast-furnaces, while some 17 millions were carbonized for the production of gas. Of course, it was to the demand for coal for power purposes that they must turn to realize the economies which were possible through the introduction of power gas.

He was not going to say that the steam-plant of this country would be entirely scrapped; but from the tendency of the times, and from the general economies which could be shown to arise from the introduction of gas power in many cases, it was not too much to hope that a very considerable reduction would be made in the quantity of coal consumed for steam raising. If out of the 45 million tons so used they could save only 9 million tons, this would be 5 per cent. of the home consumption of coal, and 20 per cent. of the total used for power purposes. Not only did they save coal in this way by the use of power gas. There was another factor of even greater importance which would arise from it. Power gas made possible the utilization of a vast quantity of fuel which would otherwise be quite unsuitable for employment as a power-raising agent. Several plants had been put down for the production of power from peat; and much colliery refuse which could not be otherwise used could be employed for power-gas making. Then, again, some wood-working factories were now using suction-gas plants fed only with waste wood or sawdust. In fact, a number of waste products in manufacturing operations could be utilized. A ton of dry peat yielded some 1000 B.H.P. per hour, together with from 70 to 200 lbs. of sulphate of ammonia worth £11 to £12 per ton. When it was remembered that in Europe there were 140 million acres of peat bog, often 14 to 16 feet in thickness, it would be seen that the utilization of but a small portion of the energy here stored up would effect a large saving of coal for other purposes.

Continuing, Mr. Brame said they must exercise discretion as to the way in which they purchased fuel. Until now, people had been in the habit of buying merely a ton of coal. But the quality of coal in relation to its calorific value would vary enormously, even in the same seam. It was no guarantee of the heat units contained in a coal to say that it came from a particular seam in a particular colliery. The only scientific plan was to say that one was buying for a penny so many heat units—making a deduction according to the amount of ash, &c., in the coal which would affect its value to the user. This system was becoming widely adopted in America, and was coming along in this country. He hoped the idea would spread more in the future.

As regarded fuel costs, the efficiency of power gas was approximately 20 per cent., while with steam 9 to 10 per cent. was a fair average. For small powers, suction gas was not a competitor with pressure gas from bituminous fuels, since gas plants using this class of fuel were unsuited for small powers by reason of their higher first costs and working charges. The pressure plants for non-bituminous fuels offered great advantages where gas was required for heating in addition to power. Pressure gas was usually somewhat richer than suction gas, and was more uniform in composition, since its production was continuous, while that of suction gas was intermittent. On the other hand, for small power plants a suction-gas apparatus offered so many advantages—such as compactness, low cost, and simplicity of working—that its rapid introduction was easily understood. Hitherto the choice of fuels had been limited to anthracite and good quality coke. The use of bituminous fuel, with its manifest advantages in the matter of supply and price, had until quite recently been impossible, owing to the difficulty of removing the tar from the gas; but practically all the leading makers now supplied suction plants which it was claimed worked well with such fuels.

As to the relative merits of coal gas and suction gas for small power plants, the lecturer showed that little advantage was obtained by the adoption of suction gas when cheap town gas was available—what little gain there was, he said, being quite counterbalanced by the conveniences arising from a town gas supply, and the total absence of stand-by charges. Above 30 H.P., however, the advantages of suction gas rapidly increased. The success of suction gas plant working on bituminous fuels (even of the most unpromising character) being now established, the extension of the use of this type of plant was likely to be very rapid. Systems of scrubbing the gas would be improved, when it was realized that such a process was essentially not a filtering one. The utilization of the exhaust from the engine instead of steam through the producer had given promising results; the poor quality of gas being more than counterbalanced by the higher compressions rendered possible in the cylinder. The abolition of the gasholder where pressure gas was needed for power purposes only, and the control of production according to demand by fans automatically working with the engine, was almost universal in German practice.

By the bequest of the late Mr. Frederick Tendron, the Deputy-Chairman of the Continental Union Gas Company, whose death was announced in the "JOURNAL" for the 19th of April last, the Trustees of the British Museum have recently acquired a few choice mineral specimens. Conspicuous among them is a magnificent, and probably unique, crystal of pyrrhotite, measuring as much as 5½ inches across. The suite also includes smaller specimens of pyrrhotite, two specimens of the rare mineral chalmersite, some well crystallized gold, &c,

THE VALUATION OF THE ILLUMINATING VALUE OF GAS BY ITS CALORIFIC POWER.

By Dr. MAX MAYER, of Berlin.

A brief abstract was given in the "JOURNAL" for the 28th of June last (p. 960) of a paper read by Dr. Max Mayer, of the German Welsbach Company of Berlin, at the annual meeting of the German Association of Gas and Water Engineers at Königsberg, dealing with the subject of the valuation of gas for lighting purposes according to its calorific power. The paper is now published in full in the "Journal für Gasbeleuchtung," and some particulars may be added to those given in the abstract which appeared at the time the paper was read.

The author points out that whereas when gas was used for lighting by means of flat-flame and argand burners its quality was simply determined by photometric measurements, the introduction and general adoption of incandescent lighting have raised the question of how gas for lighting and heating purposes is to be valued. Gases which were formerly not applicable for lighting are now available, since the effect of lighting by incandescence depends upon (1) the temperature of the gases produced by the combustion, and (2) on the method in which combustion takes place, as conditioned by the burner and mantle used. M. Sainte-Claire Deville in 1903 first propounded, on the basis of the results of experiments he had carried out, that illuminating gas should be valued according to its calorific power. He and others have made further investigations to prove the tenability of the proposition that the illuminating power of a mantle is proportional to the heat expended upon it. But this question has not been satisfactorily disposed of, as appears from the lecture delivered last year by Professor Bunte, on "What Quality of Gas is Called For?"* and by the investigations made by Mr. A. Forshaw, who in his paper on the "Illuminating Efficiencies of Carbon Monoxide and Hydrogen Used in Conjunction with Incandescent Mantles"† denied that there was any relation between calorific value and illuminating power. Some reference must be made at first to earlier researches, with a view to filling up gaps and obtaining data for criticizing Mr. Forshaw's work.

It is clear that the conditions of combustion are of great importance so far as the utilization of the gas is concerned; and in this connection the effect of the burner takes precedence. In the ordinary bunsen burner, the air required for complete combustion of the gas is introduced in two ways. One portion—viz., the so-called primary air—is mixed with the gas before combustion; while the remaining portion, known as secondary air, finds access to the flame from the exterior. There is, therefore, first a combustion of the primary air in the gas, resulting in the production in the inner cone of the bunsen flame of a mixture of water gas diluted with nitrogen; the water gas thus produced being burnt in the outer cone by means of the secondary air.

The effect of the distribution of the air between the primary and secondary supplies on the illuminating power of the mantle was first precisely determined in the investigations made by Bunte, Mayer, and Teichel. The results of their work may be briefly summarized as follows: When the gas consumption is unaltered, and consequently the quantity of heat is constant, if but little primary air is mixed with the gas a flame of large volume is produced. If the primary air is increased, and the quantity of secondary air is correspondingly diminished, the volume of the flame is less. The smallest volume of flame is attained when the air requisite for complete combustion is introduced solely as primary air. A consequence of this condition is that the fall of heat from the flame to the mantle is lower than in any other case; and thus the mantle in these conditions attains its maximum temperature and its highest illuminating power. It follows, therefore, that with the same expenditure of heat or, in other words, the same consumption of gas, it is possible to obtain in the same burner quite different illuminating effects if the quantity of primary air, and consequently the volume of the flame, is altered. The author made experiments in this connection by comparing gases of different composition photometrically in the same burner with the admission of air under pressure, so that the gases produced by combustion gave a flame of the smallest volume and raised the mantle to the highest temperature. These investigations showed that in such conditions Deville's proposition, that a direct relation subsisted between illuminating power and calorific power, was maintained within 10-12 per cent. The shape of the flame becomes extremely important, because it affects the rate of flow of the gas on to the mantle. The greater this rate of flow, the more heat reaches the mantle in unit time, and the greater, therefore, is the increase in the temperature and in the illuminating power of the latter. With mixtures of coal gas and hydrogen, and coal gas and carbonic oxide, experiments showed that, within a range of 416 and 546 B.Th.U. net calorific power, practically the same illuminating result was obtained for the same expenditure of heat. Hence it was concluded that Deville's proposition was a law very generally applicable. These experiments, however, like Deville's, were carried out with air or gas under pressure; and they applied directly only to burners supplied with air or gas under pressure, and therefore working with a sufficiency of primary air for complete combustion. But quite another problem is presented by the question of the utilization of gases of high and low calorific power in low-pressure burners—that is to say, in ordinary upright and inverted incandescent burners.

The view has been repeatedly expressed that poor gases or gases of low calorific power show a better efficiency in low-pressure burners than rich gases. It has been emphasized that gases of low calorific power require less air, and consequently, in similar conditions of burner and pressure, can more easily draw in the amount of air necessary for complete combustion, with the result that a flame of smaller volume, and consequently a higher temperature of the mantle, are produced. In this way, an explanation of the reason why poorer gases in the ordinary bunsen burner give a better lighting efficiency than rich gases which require more air, is supposed to have been afforded. As a fact, however, the conditions are entirely different, as will be shown later. Deville's law would exactly apply for low-pressure burners, in which the combustion is completed in two stages, in the inner and outer cones of the flame, if, for the same quantity of heat employed, though different gases were used, the volume and shape of the flame and the distribution of the temperature in the interior of the flame were similar. Lamps working with air or gas under pressure are supplied with the theoretical quantity of primary air, and therefore the combustion gases reach their maximum temperature in the inner cone. On the other hand, in low-pressure lamps the combustion takes place in two stages, by the admission of primary and secondary air; and hence there is a rise of temperature between the inner and the outer cone which leads the author to speak of the temperature distribution in the interior of the flame.

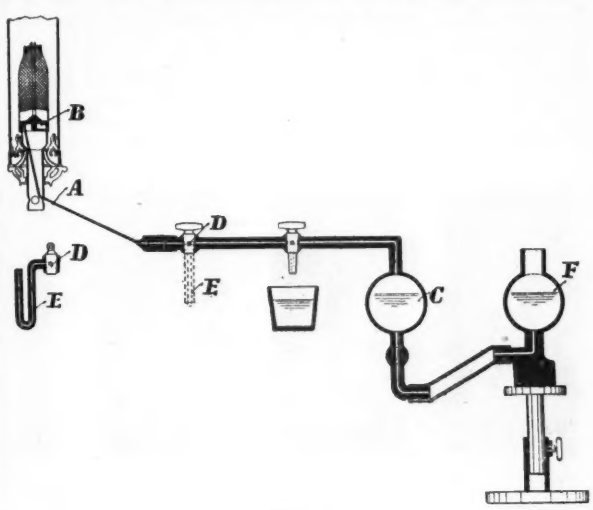


Fig. 1.

If gases of low or high calorific power are used in one and the same burner, and different proportions of primary air relatively to the total air required for the consumption of the gas are drawn in to the burner, the differences in light referred to would be expected to appear. In order to elucidate these conditions, the author carried out experiments on three upright burners—one being an ordinary Welsbach burner, and the other two burners, designated A and B, of lower consumption. The burners were first of all tried, with a well-fitting mantle which had been in use previously for 50 hours, with coal gas, and so adjusted as to afford the maximum illuminating power. The amount of heat employed was calculated from the gas consumption and the calorific power of the gas. The proportion of air required for the complete combustion of the gas was then determined on a sample. Another sample of gas was drawn from the mixing-tube of the burner immediately below the flame and analyzed for the purpose of ascertaining the quantity of primary air sucked in. The proportion of primary air per cent. of the air required for complete combustion of the gas was then calculated.

The samples of gas from the mixing-tube of the burner were taken by means of the apparatus shown in fig. 1, in which A is a finely-drawn glass capillary (of very small cross section relatively to that of the burner tube), which is carried through the wire gauze B of the burner into the inner cone of the flame. The capillary A is connected with a mercury pipette C having in the connection a three-way cock D, the third way of which communicates with a pressure-gauge E. The levelling vessel F can be moved up and down and set at any height with great precision. The pipette C is of about 150 c.c. capacity, and the filling of it with a sample occupies about one hour.

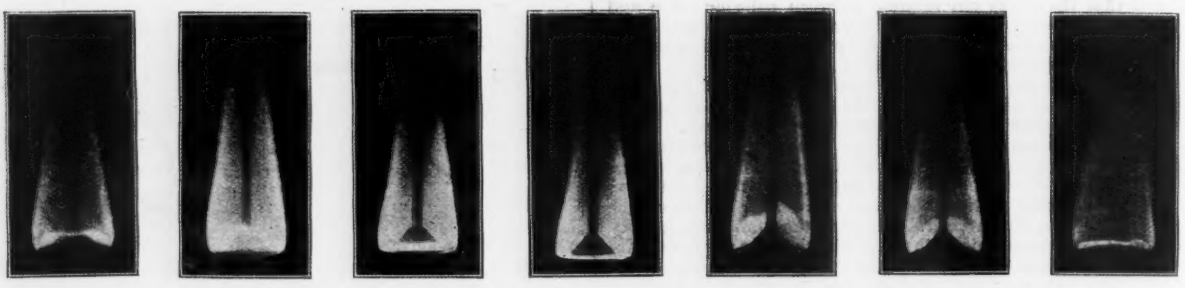
After the conditions for coal gas had been determined in the manner described, gases of varying composition and different calorific power were employed; the same amount of heat being expended as in the case of the coal gas. Gases of different calorific power were produced—some by carburetting coal gas with benzol, and in other cases by carburetting it with oil gas. Gas carburetted in these two different ways was purposely employed, with the object of observing just what effect different constituents exerted. Gas of low calorific power was produced by diluting the coal gas

* See "JOURNAL," Vol. CVII., p. 831. † *Ibid.*, Vol. CVI., p. 865.

or the two descriptions of carburetted coal gas with hydrogen. The specific gravity of the gases was determined and photographs were taken of the flames produced when the same amount of heat was being expended, in order that a record of the different shapes of the flames with the different gases might be obtained. After each trial of a new gas a check determination with coal gas was carried out, in order to ascertain that the lighting effect of the mantle had remained unaltered.

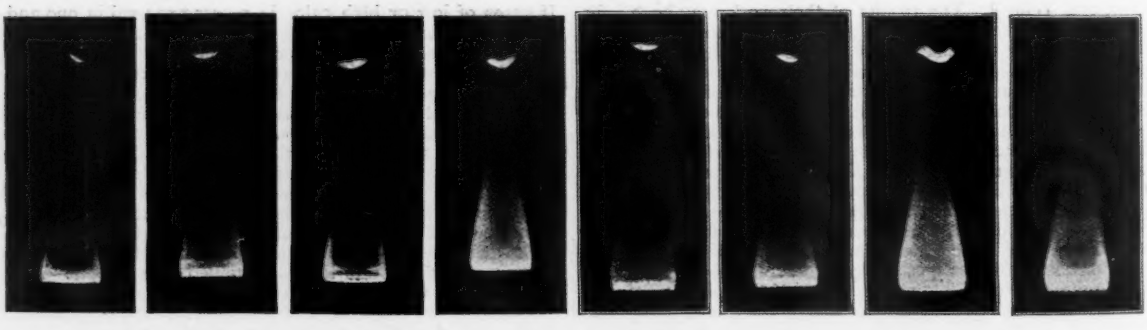
In the comparative trials with different descriptions of gas, the point of chief interest was to what extent the illuminating power varied when the heat expended remained the same. All the experiments were made with a gas pressure of 16-10ths. The composition of certain of the gases employed in the trials has already been given in Table I. on p. 960 of the "JOURNAL" for the 28th of June last. The first set of tests was made with the ordinary Welsbach burner, and the results obtained will be found on the same page, in Table II. In the first experiment, coal gas was used, and the maximum illuminating power obtainable from it was 77 English candles for an expenditure of heat of 2182 B.Th.U. per hour. The air required was 4·8 volumes per volume of the gas, and the primary air supply amounted to 54 per cent. of the total air required. The second and third experiments were made with coal gas carburetted with benzol and having a considerably higher calorific power than the uncarburetted coal gas. The consumption of gas was reduced till the expenditure of heat was the same as with the coal gas. These gases required 5·6 and 5·3 volumes of air for the consumption of one volume of gas, and 58 per cent. and 62 per cent. respectively of the total air required was drawn in as primary air. [The possible error in the determination of the proportion of primary air may be as much as 6 per cent. owing to the complexity of the methods of measurement and analysis.] The illuminating power obtained in the second and third experiments was 72 and 76 candles. The fourth and fifth experiments were with gases of low calorific power, and the consumption was increased in order to obtain the same expenditure of heat as with coal gas. The illuminating power was 79 and 82 candles respectively. The proportions of air required for complete combustion were 3·4 and 3 volumes per volume of gas, and 50 per cent. and 41 per cent. respectively represented the proportions drawn in as primary air. Hence the proportion of air drawn in was lower than with the gases of higher calorific power. It will be seen that the specific gravity of the different mixtures exerted no appreciable influence on the proportion of air drawn in. The fact that the quantity of air drawn in is smaller than with rich gases, is accounted for by the quantities of gas passing through the burner being much greater with the poor gases in order to secure the same expenditure of heat.

Looking at the results more closely, it is apparent that the poorer the gas the greater is its efficiency. But the superior effect of the poor gases used in the fourth and fifth experiments does not depend on the percentage of primary air drawn in being greater. That is an assumption which has hitherto been made because the poor gases require less air. The better efficiency of the poor gases must be traced to other conditions—viz., to the difference in the composition of the gases. As the proportion of hydrogen in the gas becomes greater, the efficiency increases. Thus coal gas with 52 per cent. of hydrogen affords 77 candles; the poor gas used in the fourth experiment, containing 80 per cent. of hydrogen, affords 79 candles; and the still poorer gas used in the fifth experiment, containing 90 per cent. of hydrogen, affords 82 candles. It is obvious, therefore, that the chemical composition of the gas has a special influence on the conditions of combustion. It has been already shown that the poor gases draw in less air than do the rich gases for the same amount of heat expended in the same burner. A worse, rather than a better, efficiency might, therefore, have been expected from them. But it is known that one of the chief factors which determine the efficiency of the gas is the volume of the flame, which expresses its heat concentration. The greater the concentration of heat of the flame, the more heat reaches the mantle in a given time, and consequently the temperature of the latter is higher and the light it emits is increased. If the reproductions of the photographs of the flames obtained in the first, second, fourth, and fifth experiments (see fig. 2) are inspected, characteristic differences will be



Experiment I. Experiment II. Experiment IV. Experiment V. Experiment VI. Experiment VII. Experiment VIII.

Fig. 2.



Experiment IX. Experiment X. Experiment XI. Experiment XII. Experiment XIII. Experiment XIV. Experiment XV. Experiment XVI.

Fig. 3.

noticed in the inner cones of the flames. In the second experiment, the inner cone is very large, and the flame has a relatively big volume; whereas the inner cone is smaller in the first experiment. In the fourth and fifth experiments, the inner cone, with a bluer flame, comes right down to the wire gauze of the burner; but the quantities of air are smaller in the fourth and fifth than in the first and second experiments. Nevertheless the volumes of the flames are smaller and the lighting effects greater. The lighting effect cannot depend on the higher flame temperatures of the gases used in the fourth and fifth experiments, as has been held for a long time, because the flame temperatures of the different gases used are practically the same. The intensities of combustion of the separate gases in the mixtures are, however, not the same. The bunsen flame may be regarded as a stationary explosion; that is, the position of the inner cone depends on the velocity of issue of the mixture of gas and air being equal to the velocity of propagation backwards of ignition. In conditions similar in other respects, therefore, those gaseous mixtures have the higher concentration of heat in which the inner cone of the flame rests nearest to the top of the burner.

The highest rate of propagation of ignition in air has not hitherto been determined very exactly for separate gases. Ignition of mixtures of hydrogen and air proceeds at the rate of 4·2 metres (= 13·78 feet) per second; of methane and air mixtures, 0·6 metre (= 1·97 feet) per second; and of coal gas and air mixtures, 1·3 metres (= 4·26 feet) per second. These maximum rates of propagation are obtained when there is a small excess of combustible gas, and not with the theoretical mixtures of gas and air. These figures, which afford proof of the much higher intensity of combustion of hydrogen, are taken from results of experiments made by Professor H. Bunte in 1899. If the velocity of issue of a jet of gas is increased by raising the pressure, then with corresponding velocity of flow the flame can be raised and blown away from the mouth of the burner—*i.e.*, it can be extinguished. The pressure at which this happens has been called by Bunte the pressure of extinction. This figure for certain gases in

a rat-tail burner with a hole 0·75 mm. diameter and 0·449 mm. cross section is given in the following table :—

—	Carbonic Oxide.	Methane.	Ethylene.	Hydrogen.	Coal-Gas.	Water Gas (53·7 p.ct. CO) (36·1 p.ct. H_2).
Pressure of extinction in tenths of an inch . . .	1·73	2·20	45·3	1042	324	·321
Velocity of the jet of gas in feet per second . .	22·30	34·50	115·0	1601	450	371

These figures cannot be applied directly to the Welsbach burner, as the conditions of combustion in it are totally different. But it may be accepted from them that the pressure of extinction of hydrogen is much higher than that of the other gases, and that the velocity of the jet of gas is much higher with hydrogen.

The foregoing experiments having established the fact that the composition of the gas has a considerable effect upon the economy of the burner, it was decided to make experiments with gases, of other composition and higher calorific power, produced by the addition of oil gas. The composition of the oil gas used was given in Table I. on p. 960 of the "JOURNAL" for June 28 last, which table also showed the composition of the mixtures of coal gas and oil gas, and coal gas and hydrogen which were used in the sixth, seventh, and eighth experiments. A new mantle was used for this set of experiments, the results of which have been shown in Table II. on the same page. Experiment No. 8A was made with coal gas having a net calorific power of 479 B.Th.U. per cubic foot, and with the consumption at such a rate that the heat expended per hour amounted to 2262 B.Th.U. With this expenditure of heat, the coal gas gave a light of 76½ candles. In the sixth experiment, a mixture of one volume of oil gas with eight volumes of coal gas was used at such a rate of consumption that the heat expended was the same as with the coal gas in experiment No. 8A. The light obtained was only 68 candles. In the seventh experiment, a mixture of one volume of oil gas and 17 volumes of coal gas was used, and the light obtained was 70 candles for the same expenditure of heat. In the eighth experiment, a mixture of one volume of oil gas with nine volumes of hydrogen was used, and a light of 88 candles was realized for the same expenditure of heat. The proportion of hydrogen in the mixtures used in the sixth and seventh experiments was practically the same as in coal gas; but in the eighth experiment it amounted to 92 per cent. The quantities of air drawn in to the burner decrease as the gas becomes poorer; nevertheless the lighting effect improves. A comparison of the composition of the mixtures of gas used in the sixth, seventh, and eighth experiments shows that there is considerable difference in the proportions of heavy hydrocarbons and of methane. The photographic views obtained in the sixth, seventh, and eighth experiments (see fig. 2) show that the mixture used in the sixth experiment gives the largest inner cone, while it contains the highest proportion of hydrocarbons. The flame in the eighth experiment has the smallest inner cone and gives the highest efficiency, though the gas used contained only 2·1 per cent. of heavy hydrocarbons and 4·6 per cent. of methane. No further proof is necessary of the proposition that the composition of the gas and the intensity of combustion of the constituent gases have a considerable influence on the effect obtained in the same burner from different gases for the same expenditure of heat. The composition of the gas and its velocity of efflux play almost a greater part than does the quantity of air drawn in. It follows generally, therefore, that as the calorific power of a gas falls, and the proportion of heavy hydrocarbons decreases, the calorific power of the gas is more fully utilized in the Welsbach burner.

The effect rises very greatly as the proportion of hydrogen in the mixture of gas is increased. The improvement in the utilization of the gas is to be traced back to the much higher intensity of combustion of the hydrogen. The extent of the influence of the somewhat higher flame temperature of the hydrogen must not be overlooked. As to the practical significance of the results obtained, it will be seen that the mixtures used in the first, second, third, sixth, and seventh experiments were such as might be produced in practice. Their net calorific power ranged from 479 to 584 B.Th.U. per cubic foot. The light obtained for the same expenditure of heat with these gases varied only between 68 and 77 candles. It may, therefore, be stated certainly, in so far as gases which come into question in the gas industry at the present day are concerned, that the calorific power can be regarded as a criterion of the efficiency for lighting. The greatest deviations amount to only 10 to 12 per cent.

It may be seen also from Table II. on p. 960 of the "JOURNAL" for the 28th of June how misleading it may be to judge mantles or burners according to their consumption of gas per candle-hour. The correct method of valuation undoubtedly is the determination of the heat units consumed per candle-hour, because the volume of gas burnt for the same quantity of light produced varies very greatly with the calorific power. So long as we are using gases of different calorific powers and of different compositions, fluctuations to an extent of from 10 to 15 per cent. in the results obtained with the same burner and mantle will be unavoidable. Those obtained with the ordinary Welsbach burner correspond also with the results obtained in the same manner with the burners designated "A" and "B" given in Tables III. and IV. on the page of the "JOURNAL" already mentioned. Experiments 12 and 16 referred to in those tables were made with mixtures of gas containing a high proportion of heavy hydrocarbons, and they showed the worst results. The pictures of the flames given in fig. 3 will show that the experimental gases behaved in the same manner as in the Welsbach burner. The quantities of air drawn in were, however, a trifle larger as compared with those of the Welsbach burner. The agreement between the forms of the flame shown in the pictures and the composition of the gases given in the tables in the previous number of the "JOURNAL" is apparent.

With reference to the investigations made by Mr. Forshaw on hydrogen and carbonic oxide, and his conclusion that there was no relation between illuminating power and the heat expended in the incandescent burner, his results become intelligible if regard is paid to the experimental gases and the arrangements which he selected. In the first place, hydrogen and carbonic oxide differ completely in their behaviour on combustion. The proportion of air required by the two gases is indeed the same; but with this all similarity between them disappears. The calculated flame temperature for hydrogen is about 2000° C., and for carbonic oxide about 2140° C. The velocity of propagation of ignition of the two gases is so different that it is impossible to test them in the same burner with the same mantle at the same expenditure of heat. Hence no proper comparison can be made between the two gases. The results moreover, being obtained with pure gases, have no practical importance. Deville's proposition is not directly a law; but for mixtures of gases within a certain range of calorific power it becomes a useful rule, which is shown by the author's experiments to be valid for low-pressure upright incandescent burners with the descriptions of illuminating gas now commonly employed.

SURFACE BRIGHTNESS, AND A NEW INSTRUMENT FOR ITS MEASUREMENT.

By J. S. DOW and V. H. MACKINNEY.

[Abstract of a Paper Submitted to the Optical Society last Friday.]

In the opening of the paper, the authors referred to the developments in photometry from the measurement of light sources to the illumination afforded. But even measurement of illumination does not exactly describe practical conditions. For, after all, what really concerns us is not only the illumination arriving on a surface but the actual "surface-brightness" which results. For example, it may happen that a good illumination is provided to show off the wall-papers in a room. But if these are of a very dark tint only a fraction of the light reaching them is reflected again. Measurement of surface-brightness would seem to be an important link in the chain of processes connected with the study of illumination, all of which have their sphere of usefulness.

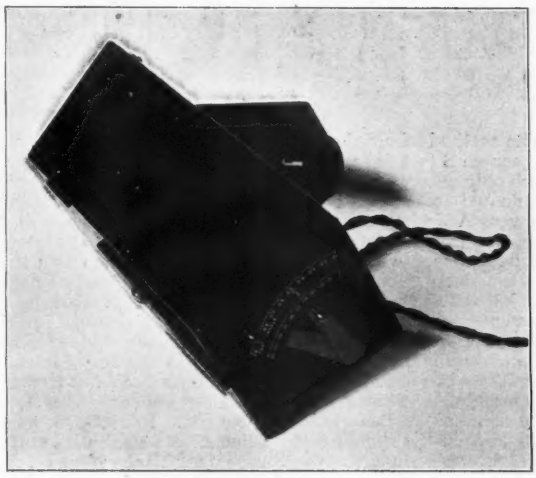


Fig. 1.

It therefore occurred to the authors that a description of a new form of instrument, primarily designed for the measurement of surface-brightness (though it can also be used for other purposes) might be of some interest. It is to be distinguished by the name of "Lumeter." The general appearance of the apparatus is shown in fig. 1. The idea of the instrument is to enable an observer to measure the surface-brightness of any surface by comparing it direct with a standard illuminated white one. The manner in which this is done will be understood from fig. 2. The observer looks direct at an illuminated screen, and sees, through an aperture therein, the illuminated surface to be studied. This screen

is illuminated by means of an opal glass plate. Behind it is a small metallic filament glow-lamp at a sufficient distance to render the screen of uniform brilliancy. In the illustration (fig. 2) the screen, with its circular aperture, has been taken out, and will be seen resting against the box. The sector-shaped opal surface can also be clearly noted.

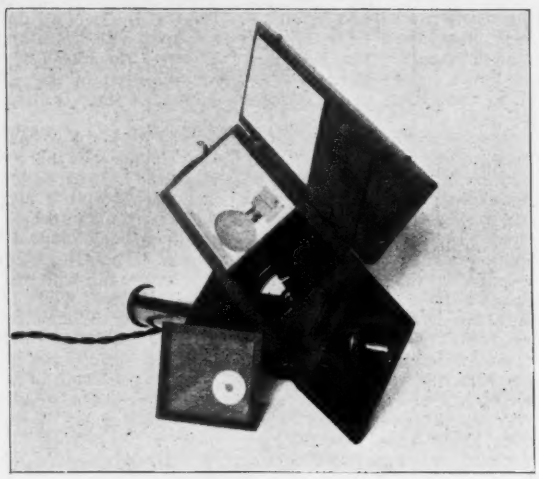


Fig. 2.

The screen has been made by depositing a matt-white precipitate on thin glass, and then scraping away a central disc. In this way a very fine line of division between the photometric surfaces can be secured. There were certain initial difficulties to be overcome in this method; but it is believed there seems to be now no difficulty in securing a satisfactory matt and permanent surface, provided the precipitate is suitably prepared. This device, like many others utilized in the instrument, is largely due to the ingenuity of Messrs. Conrad and William Beck. The screen is subsequently covered by a thin glass plate, which is bound in position. The actual white surface is thus preserved from air and moisture, and the glass cover can be handled with safety and easily cleaned. The position of the screen is such that no direct reflection from this surface into the eyepiece is possible.

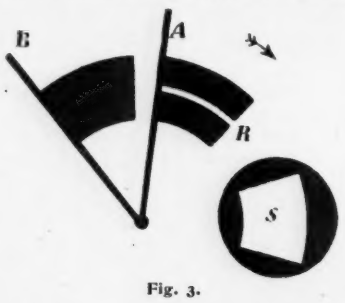


Fig. 3.

The method of altering the illumination is somewhat unusual. The screen S (see fig. 3) is covered by an opaque diaphragm D, which only allows a sector to be exposed. In front of this evenly-illuminated sector, two corresponding opaque screens, attached to levers A and B, can be made to pass. As the screen A is moved in front of the sector, its area, and therefore its intensity as a light-source, will be uniformly diminished from, say 1 to 0·1. The remaining intensity, 0·1, is derived from the part of the surface still visible through the ring R. The area of R is arranged to be exactly 1-10th of the total area of the bright sector. The lever attached to A therefore travels on an equally divided circular scale with nine divisions from 1 to 0·1. Having drawn across the lever A, we can gradually reduce the illumination still further by also bringing over the lever B. This exactly resembles A, with the exception that there is no ring cut out. In doing so, we gradually cut off the illuminated portion of the opal plate still left exposed, and reduce the illumination uniformly from 0·1 to 0. The lever B travels on a second scale immediately above that of A, graduated from 0·1 to zero.

A word or two may be said regarding the units in which the scale ought to be calibrated. Strictly speaking the instrument measures "surface brightness" or "intrinsic brilliancy," This may be expressed either in terms of "candles per square centimetre," or in terms of the illumination in "lux" or foot-candles which a truly white surface would have to receive in order to have equivalent brightness. The latter is the suitable method for most practical purposes, and has been adopted in this instrument.

Before using the apparatus one adjusts the position of the glow lamp illuminating the opal plate until the brightness of the white surface S—as compared with another similar white surface illuminated by means of a standard lamp at a specified distance—is (say) exactly 1 foot-candle. One then fixes the lamp in this position, and regards the scales as registering in foot-candles. It is of course, desirable to reset the lamp from time to time as the pressure of the accumulator gradually drops, and the candle power of the lamp eventually falls. In doing so, it is naturally preferable to utilize an incandescent lamp or flame standard mounted on a photometric bench; but probably an accuracy sufficient for many practical purposes can be attained by the use of a "standard candle" placed exactly 1 foot away. When using such an instrument as this, we are in many cases only concerned with relative values. For example, it may be desired to demonstrate that the illumination on a table is multiplied to a certain amount by using a certain reflector; or it may be desired only to study the distribution of illumination over a table, wall, or illuminated placard, &c. In such cases the extreme accuracy of the absolute value of the result does not greatly matter; all that is desired is that the instrument shall not vary during the measurement, and that the scale shall be strictly proportional.

By means of the device already described, one can measure values from under 1-100th to 1 foot-candle. It is also proposed to equip the instrument with two dark glasses, each absorbing 1-10th of the light passing through them, in order to increase the range of the instrument upwards. Either one or both of these glasses can be inserted in the path of the rays from the surface studied—thus enabling values as high as 100 foot-candles to be measured. Naturally, some care is necessary in selecting glasses which do not unduly absorb light of certain colours; but there seems to be little difficulty in securing that any error so caused will not be material from a practical standpoint. As an illustration of the wide range of brightness that can be measured by this means, it may be mentioned that the writers have measured values of over 50 foot-candles in shop windows; while it is also possible to estimate the brightness of the sky at night-time. This proved in one case about 0·008 foot-candle. In another case, owing to the diffusion of light from neighbouring arc lamps, a value of 0·015 foot-candle was registered.

There were a large number of special difficulties originally met with in securing a uniform scale; but the scale can now be regarded as correct within 5 per cent. over its length. The authors, however, would like to emphasize the importance of careful supervision in the case of instruments of this kind, as relatively small defects may lead to considerable errors if due care is not taken. They therefore propose to examine personally every instrument before it is sent out for use, in order to ensure that everything is satisfactory. It should, of course, be understood that the obstacles referred to above were difficulties in design only, and not in use. Once the instrument is correctly made, it should give anyone using it no trouble, as the parts are not easily deranged, and the whole construction is simple.

Although mainly intended for the measurement of surface-brightness, the instrument can be readily employed to measure illumination. In this case, a white surface is exposed to the illumination of the standardizing lamp, and the same surface is used for subsequent measurements. For this purpose, a screen that is diffusive and dead-white is desirable. Yet, as the same screen is used both in calibration and in experiment, any error caused by imperfect compliance with these conditions tends to "cancel out" as far as measurements of illumination are concerned. For practical purposes, good white cardboard or drawing paper, from which any glaze has been removed, answers. It is often convenient to pin into position in inconvenient corners; it is cheap; and it is readily replaced when soiled. The size of the surface employed naturally depends upon the distance from which it is likely to be observed. For near work a piece about the size of a half-crown is often ample; and the ability to use such a small surface enables one to penetrate into crannies where it would otherwise be impossible to obtain a measurement. One case in which white card or paper is convenient is in getting a rough idea of the reflecting power of wall-papers, curtains, &c. All that is necessary is to pin the card on the material in question, and take, first, a reading of the illumination on the white card, and then of the surface brightness of the adjacent material.

By a very simple addition, the instrument can also be utilized to measure the candle power of lamps in a room or street. A small tube terminating in an opal glass plate, ground on both sides, is inserted in front of the photometric screen. The observer then merely presents the instrument towards the lamp studied and balances the illumination of this opal plate. Then, knowing the distance of the source, he can readily calculate its intensity. It is, of course, necessary to determine once for all the constant of the instrument before use.

The compactness and the portability of the instrument, which enables it to be fixed, together with the accumulator, in a small case, and carried knapsack fashion on the back, or even in an overcoat pocket, is very convenient for practical measurements. Moreover, a measurement of the brightness of a surface by means of the instrument is unaffected, within wide limits, by the distance away of the observer.

The chief advantage of surface-brightness measurement is that it enables one to go right to the root of the matter—to study the illumination at the exact spot with which we are most concerned. With the instrument described, one can determine not only the illumination provided by the lighting engineer, but the resulting actual brightness of the objects illuminated. Again, in studying distribution of illumination, it is often very convenient to measure surface-brightness. For example, one can determine the distri-

bution of light over a large placard or the face of a building by merely pointing the instrument in the desired direction. In this way, one can reach parts from which it would otherwise be extremely difficult—almost impossible—to get a measurement.

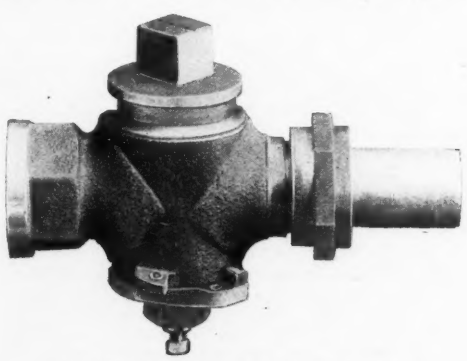
A few experiences of the use of the instrument in various interiors, &c., were mentioned by the authors. The study of wall papers was especially referred to, as was also the investigation of illumination in school rooms. Proceeding, they remarked that special care has been taken in the design of the instrument, in the hope that it might also be found useful for many laboratory purposes in which the very highest precision necessary for standard work is not demanded. It is somewhat curious that in photometrical laboratories, technical colleges, &c., there is often no mean between extremely elaborate experiments and the use of inconvenient and antiquated apparatus. An instrument such as this, in which a uniform scale is employed, saves a considerable amount of time, since the result can be read off at once; and the long calculations based on the inverse square laws, usually associated with work on a photometric bench, are avoided. Probably, therefore, an instrument based on this system, which can be used to measure either surface-brightness, illumination, or candle-power, would often be a valuable adjunct in the photometrical laboratory.

Discussion.

There was a short discussion on the paper; but there are not many points in the remarks which we need note, as forming any material supplement to the sketch given above of the contents of the communication. It was pointed out by Mr. Conrad Beck that the new invention would demonstrate the extraordinary differences of the lights through which one was accustomed to pass in the course of an hour or two in the evening without noticing any differences. An instrument of this kind, he also pointed out, would enable a great deal of useful scientific work to be done with reference to illumination which would allow a more thorough realization of the extraordinary differences under which the human eye could be comfortable, owing to its great adaptability. The new instrument should be useful in, among other directions, tabulating and forming scientific estimates for illuminating interiors and surfaces of buildings for producing pleasing architectural effects. Mr. Leon Gaster voiced the feelings of those present in saying Mr. Dow and Mr. Mackinney ought to be thanked for the instrument they had brought before the meeting. He thought that the appliance would be very useful to factory and school inspectors, who regarded the old photometrical apparatus and calculations as too much for them. It was light, portable, and sufficiently accurate for general purposes. Mr. John Darch was sure the instrument would soon be in the hands of a large number of people—anyway, it was a thing for which he had been looking out for many years. There were other speakers—Professor Chalmers (the President) among the number; but their remarks were nearly all directed to suggestions as to where there might, in their opinion, be improvement in some detail of the instrument, and to pointing out, from their own experience, useful applications for the instrument. Mr. Dow and Mr. Mackinney dealt with these in their replies; but it was quite evident that they are not convinced that the suggestions advanced will in any way conduce to betterment.

THE "SOLARI" PATENT COCK.

A patent main and sealing cock, which has met with a considerable share of approval, has just been introduced by Messrs. Willey and Co., Limited, of Exeter. Instead of the old method of stop, with cut-down barrel and pin in the plug, two stops are cast on the bottom barrel which engage with a stop in the bottom washer. These are made large enough for a screw hole to be drilled, so that the cock may be made secure either open or shut



The "Solari" Patent Main and Sealing Cock.

as desired; the screw for this purpose being found in the bottom of the plug, as shown in sketch. The advantages claimed by the firm for the "Solari" patent cock are that the positive stop arrangement dispenses with the old and undesirable form of stop-pin; all leak troubles due to the old form of stop-pins are entirely eliminated; it is an ordinary main-cock, and can also be sealed at will.

YORKSHIRE JUNIOR GAS ASSOCIATION.

Eighth Annual Meeting.

Some two or three years back, the different Junior Gas Associations allotted out among themselves the various Saturdays in the month, so as avoid unnecessary clashing and crowding of the columns of the Technical Press. In accordance with this rule, the Yorkshire Junior Gas Association holds its annual meeting on the third Saturday in October; and the eighth such gathering was held last Saturday in the Leeds University, as on previous occasions.

Mr. S. W. SHEPHERD, the retiring President, took the chair. The Secretary's report, which had been circulated among the members, was taken as read, and the Treasurer's report was similarly adopted, with many complimentary remarks on its satisfactory character. In formally laying down his office, Mr. Shepherd referred to the prosperity that had attended the Association during the past year, and the happiness he had enjoyed in his work, for both of which he thanked his fellow-officers. Though the duties had been by no means onerous, he felt some little regret in resigning them, though it was a great pleasure to hand them over to so worthy a successor. Mr. Scholefield was an older man in the work of the Association, having been its first Secretary and largely concerned in its conception and successful launching. In many other respects, he would be able to fill the post better. He wished him every success and happiness, and a continuance under his guidance of the high position and usefulness of the Association.

Mr. FRED SCHOLEFIELD, the Assistant Engineer and Manager of the Dewsbury Gas-Works, then took the chair and thanked his introducer and the members for their welcome. While appreciating the vote that placed him in this position, he should not have occupied it had he merely consulted his own feelings. He had, however, no desire to evade the responsibilities even of an unsought position; and he felt strongly the call to each and every member to take his part in the work of the Association. So far as his abilities allowed, he would endeavour to discharge his duties with some degree of credit to himself and satisfaction to the members, knowing the kindly consideration and co-operation upon which he could rely. He was proud of the good work done in the past directly and indirectly by the Association, and looked confidently to a development of this usefulness limited only by the degree to which the members at large loyally stood by and participated in the work done.

On behalf of the Council two alterations in the rules were proposed by Messrs. Shepherd and Cranfield, and sanctioned by the meeting—one opening membership in the Association to articled pupils in engineering establishments destined to pass into the gas industry, and in this way beginning their training; the other dealing with the question of participation in visits to works.

The PRESIDENT, on behalf of the Association, then presented the retiring Secretary, Mr. C. T. B. Roper, with a gold watch suitably inscribed, which had been subscribed for among the members. As being the one primarily responsible for Mr. Roper taking up the work six years before, he had admired his determination and courage in so long and honourably filling the position. As first Secretary of the Association, and a member of the Council ever since, he knew full well what a great amount of time and trouble Mr. Roper had devoted to the interests of the Association. He had won the admiration and confidence of all the members, and had brought into his work great business capacity, ungrudging devotion, and notable tact and courtesy. To him they owed not a little of the excellent position held by the Association, and its record of useful work.

Similar and very cordially expressed appreciations were offered by Messrs. Shepherd, Hill, Cranfield, and Fligg, who had been Presidents during his term of office.

Mr. ROPER briefly replied, thanking the members for their all too generous words and gift and their kindly estimate of his past services. He begged a similar kindly forbearance to his yet unappointed successor, and promised him in advance all the help he could render.

The ballot for officers resulted in the following elections:—

President.—Mr. Fred Scholefield, of Dewsbury.
Senior Vice-President.—Mr. W. N. Booth, of Huddersfield.
Junior Vice-President.—Mr. W. W. Atley, of Whitwood.
Ex-President.—Mr. G. W. Shepherd, of Bradford.
Secretaries.—Mr. J. E. Sutton, of Bradford; Mr. W. Cranfield, of Halifax.
Treasurer.—Mr. E. Garsed, of Elland.
Council.—Messrs. J. Fell, of Halifax; G. W. Fligg, of Dewsbury; J. H. Hill, of York; R. Halkett, of Leeds; C. T. B. Roper, of Bradford.

Votes of thanks to the retiring officers and to the University authorities for the use of rooms for the meeting and lecture closed the business proceedings, after which an adjournment was made to the Chemical Lecture Theatre to hear the lecture by Professor J. B. Cohen, Professor of Organic Chemistry at Leeds University. His colleagues, Professors Smithells and Bone, were also present at the lecture.

The PRESIDENT, in introducing the lecturer, spoke of the pleasure they all had in welcoming him at this his first appearance among them, and of their sense of the high honour conferred upon

them in having been addressed at their annual meetings by no less than four of the University Professors. Professor Cohen's work in connection with organic chemistry was too well known to need more than passing mention, recognized as he was as one of the first authorities and finest teachers of the subject. The brilliant researches in organic chemistry that had been carried out in Leeds by Professor Cohen and his pupils had extended his fame far and wide. When the Yorkshire College was made the University of Leeds, a separate Professorship of Organic Chemistry was created; and Dr. Cohen became first occupant of the new chair. The subject of the afternoon's lecture was a singularly appropriate one, of present-day importance. Professor Cohen's interest and investigations in "Smoke"—its character, evil results, and avoidability—are of no recent awakening. He had pursued this study for nearly twenty years, and was recognized as one of the foremost authorities and most devoted reformers in this matter. They remembered also Professor Cohen's valued co-operation in the "Stoves" research still being carried out in the University on behalf of the Institution of Gas Engineers. One remembered these things and contrasted his scientific accuracy, self-restraint, and concentration on feasible reforms with the recent outbursts of Professor Armstrong in praise of the derelict coalite process, and his ill-timed attacks on the London and other gas companies for their non-complete removal of sulphur from their gas. With Professors Smithells, Cohen, and Bone so long and brilliantly working at problems in connection with gas—long before the new Department of Fuel and Lighting was thought of—the establishment of the Livesey Professorship at Leeds was thus clearly a case of natural selection, and left nothing to be desired in its appropriateness.

Professor COHEN then delivered the following lecture.

THE NATURE AND EXTENT OF AIR POLLUTION BY SMOKE.

When we consider the fact that something like a million tons of good fuel pass into the air as smoke every year, the utilization of this waste is obviously one of considerable economic importance. If the loss were restricted solely to the value of the unburnt fuel, a country as wealthy as Great Britain might perhaps afford to wait patiently till means had been discovered for removing it. But we know this emission of smoke brings in its train a host of attendant evils, the cost of which is many times the monetary value of a million tons of coal.

The smoke problem divides itself into three distinct parts—the cause, the effect, and the remedy. The cause is easily explained. It is mainly a chemical question, into which I do not propose to enter. The suggested remedies are various and manifold. These are partly chemical, such as the substitution for coal of combustible gas, coke, anthracite, or coalite; partly mechanical, as illustrated by the use of mechanical stokers, forced draught, and other appliances; and partly political, as exemplified by the more or less inadequate system of penalizing the smoke producer, which, however, does not touch the householder. Mr. de Morgan, the novelist, has suggested an ingenious device for inducing the householder to consume his smoke by taxing him at so much a pound on the soot extracted from his flues by a government chimney sweep—the tax being graduated according to the rateable value of the property.

It is, however, with the effects of smoke that I intend to deal this afternoon, and for this reason: being, as a nation, extremely conservative in our habits, unscientific in our attitude of mind, and dominated by our commercial interests, it is difficult to introduce a scientific system of burning fuel; it is more difficult to persuade people, manufacturers or householders, to apply it; it is most difficult of all to induce the authorities to enforce anything which may be thought to interfere, even remotely, with the commercial interests of the manufacturer or the liberty of the private citizen. So deeply rooted is our conservatism that not even the bait of pecuniary gain derived from the utilization of the unburnt coal is sufficient as a rule to overcome the prejudice in favour of older methods. There is no doubt that the use of gas for heating is gradually gaining ground among the more enterprising and enlightened manufacturing firms, because they find it more economical and efficient. But nothing but outside pressure, steadily and firmly applied, will induce the great bulk of coal users to make a change. In order to produce this pressure, we must find an answer to the question: what are the real evils of smoke?

It is no good appealing to the authorities on the ground that coal smoke is unsightly, and even that it shuts out some of the daylight. No Government is much affected by æsthetic considerations. The head of the Local Government Board may deplore the grime and ugliness of our big towns, and sympathize with the efforts which a few societies are making to improve matters. But he must have a stronger inducement than mere sentiment before he brings forward new forms of legislation; and no President of the Local Government Board has yet ventured to pledge himself to any definite policy in regard to meeting the evil of smoke more effectively than is done under our present system. But if it can be shown beyond any question that the effects of smoke are distinctly detrimental to the health of the community, or clearly pernicious in other ways, and that its removal can be effected without loss or discomfort to the manufacturer or householder, then the authorities have not only the right, but it is their positive duty, to interfere. What, then, are we waiting for? My own opinion is that we want more information. What is the quantity of smoke emitted? What is the quantity deposited? How far does it affect the health of the community? To what extent, if at all, does it corrode masonry or brickwork? Does it seriously interfere with vegetation? Do its effects extend beyond the immediate vicinity of the town? To what extent does it shut out sunlight, induce or aggravate fog? What is the increased cost of cleaning? These are some of the material facts about which we ought to have information before we can make an appeal upon which the Government authorities can be induced to act.

It is to some of these questions that my colleague, Mr. Ruston, and I have been trying to obtain definite answers. I attempted, in 1894, to estimate the amount of solid matter in Leeds air by aspirating a known volume of air through weighed plugs of cotton wool. The process was carried out near the centre of the town, where there was little traffic, for fifty days from the middle of April to the middle of June, about 20 cubic feet of air being aspirated daily. The average of two sets of experiments gave 1·2 and 1·16 mgrms. respectively in 100 cubic feet. If the smoke area covers 4 square miles, and rises, according to Angus Smith's estimate, to a height of 300 feet before being dispersed, this quantity will represent 8 cwt. of solid matter in suspension; and if the air is renewed fifty times, in twelve hours, it means 20 tons of solid matter delivered into the air at that rate. This solid matter, judged by the black colour of the plugs after filtration of the air, must be mainly soot. Now 20 tons would represent ½ per cent. on 4000 tons, which may be taken as the average daily coal consumption in Leeds. This is, of course, a rough calculation; but from the fact that more than 5 per cent. of coal burnt in domestic fire-places is emitted as soot, I am inclined to think the figure is much below the mark.

As to the quantity which falls—and there is a daily soot fall—we have two sources of information which substantially agree. In January, 1892, snow fell in Leeds and lay on the ground for several consecutive days during clear, frosty weather. Each day a fresh square yard of snow was collected from the centre of the town, melted and filtered, and the soot estimated. The weight of solid matter carried down in the first sample was equivalent to 16 cwt. to the square mile (= 240 tons per annum), and the additional weight each day was equivalent to 4 cwt. to the square mile; or, taking 4 square miles as the thickly-populated part of the city, and assuming the amount to diminish gradually towards the fringe of this area, the quantity may be roughly estimated at half-a-ton as the daily fall. This, again, is, I believe, under the mark. Mr. Ruston has estimated the amount of suspended matter by collecting and filtering the rain at various centres in and around Leeds from November, 1907, to October, 1908. Ten stations were selected at Leeds, and one at Garforth, 7½ miles due east of Leeds. The rain was collected by funnels, 12 inches in diameter, fitting into the neck of glass bottles, which were emptied and the contents analyzed once a month. These monthly samples include all atmospheric impurities, both soluble and insoluble, falling on a circular area 12 inches diameter. These impurities consist of those in suspension—viz., soot, tar, sand, and mineral matter—and those in solution, principally sulphurous and sulphuric acids and their salts, chlorides, in the form of common salt or free hydrochloric acid, and nitrogenous matter, in the form of nitrates, ammonia, and albuminoid substances. The final results in each case are worked out and expressed in pounds per acre per annum, and are given in the following table.

Analyses of Rain Water, Leeds and Garforth. Total for Year, Expressed in Pounds per Acre.

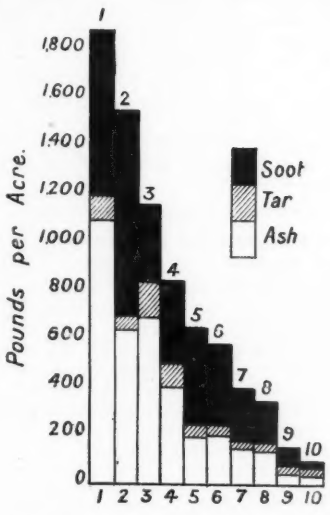
	Collecting Station.	Suspended Matter.	Tarry Matter.	Mineral Matter.	Free Acidity as H_2SO_4.	SO_3.	SO_2.	Chlorine.	Nitrogen as NH_3.	Nitrogen as N_2O_5.	Nitrogen as Albuminoid Ammonia.	Total Nitrogen.
Industrial.	1. Leeds Forge	1886	110	1113	35	123	34	164	13·0	0·0	4·7	17·7
	2. Hunslet.	1565	69	655	90	185	24	198	15·5	0·0	2·9	18·4
	3. Beeston Hill	1163	149	709	30	269	54	101	14·4	0·5	3·5	18·4
	4. Philosophical Hall (town).	849	78	423	45	149	38	75	14·4	0·3	2·2	16 9
Residential.	5. Headingley.	659	43	199	11	118	32	41	11·1	1 1	0·8	13·0
	6. Armley . .	593	34	216	29	110	37	108	9·9	1·0	3·2	14·1
	7. Observatory	399	32	146	26	85	39	51	8·4	0·8	1·6	10·8
	8. Kirkstall .	352	28	141	8	77	56	57	7·7	0·2	2·3	10·2
	9. Weetwood Lane	147	26	54	11	82	13	34	8·3	1·1	2·1	11 5
	10. Roundhay.	90	14	49	0	53	16	38	5·8	0·7	1·3	7·8
	11. Garforth (country)	—	—	—	28	65	21	22	5·0	3·2	1·1	9·3

The solid impurities diminish rapidly as we pass northward from the centre of the town. Taking the centre as the unit, one mile out they fall to half, and two-and-a-half miles out, they fall to one-sixth; while in the chief industrial centres of Leeds these impurities are twenty times as great as in the purer atmosphere of Roundhay, about three miles north-east from the centre of the town. The waste of fuel in the form of unburnt coal passing into the atmosphere must be very large, for we get in Hunslet each year about 9 cwt. of soot per acre, or nearly 300 tons per square mile actually reaching the ground; while the average amount for the whole area included in the investigation, roughly 16 square miles, or 4 miles square, works out to 100 tons per square mile per annum. Taking the average of five stations included in this 4 square mile area, we have an average of 190 tons per annum,

or, roughly, ½ ton per square mile a day—a result approximately the same as that derived from the snow-fall experiments.

Soot is not pure carbon, but contains about 15 per cent. of a thick oil, by virtue of which it adheres tenaciously to everything, so that it cannot be removed by rain. It is, in fact, a kind of varnish. In order to ascertain the effects of this sticky material in the soot, I stationed, during the winter and spring of 1893 and 1894, three glass plates, a foot square—one in a garden at Pool (nine miles from Leeds), one on the University roof, and one on the roof of the Philosophical Hall (near the centre of the city). All were some distance from the neighbourhood of chimneys. The deposit on these plates after an exposure of a few weeks (loose matter having been washed away by rinsing with water) was analyzed and weighed. Fresh plates were then put in the places of those removed and the process repeated from month to month. The deposit consisted of 50 per cent. of carbon, or, roughly, three-quarters of it was soot; the proportion was as follows: for one part deposited at Pool, there were ten times the quantity at the University and twenty-four times the amount at the Philosophical Hall. The quantity of deposit varied at different times of the year; but the proportion remained practically constant.

This black, adhesive film represents a daily deposit weighing about 25 lbs., which covers the smoke-infected area with a permanent and ever-deepening coat of fast colour. The experiments are now being repeated at five stations in Leeds. Mr. Ruston has also estimated the tarry matter in the deposit at the different stations by extracting the soot with ether. At the Philosophical Hall, the amount of tar deposited in the year corresponded to 80 lbs. per acre; one mile to the North, the deposit was 32 lbs.; at 2½ miles to the North, it had fallen to 25 lbs.; and at Roundhay, 3½ miles to the north-east, to 14 lbs. It is this



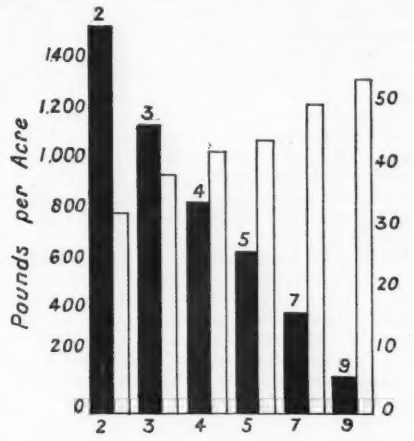
1, Leeds Forge 2, Hunslet. 3, Beeston Hill. 4, Philosophical Hall. 5, Headingley. 6, Armley. 7, Observatory. 8, Kirkstall. 9, Weetwood Lane. 10, Roundhay.

Fig. 1.—Suspended Matter.

adhesive deposit which discolours buildings and blackens vegetation. Unfortunately, it does more than blacken vegetation; it fills up the pores of the leaf, prevents the natural process of transpiration, and gradually destroys the plant. Experiments by Mr. Ruston are now in progress on the relative rate of assimilation of carbon dioxide by clean and blackened leaves; and the differences are most striking and instructive. The diminished vitality due to this cause, as well as to the action of acid to be presently discussed, is answerable for the destruction or stunted growth of evergreens near the centre of a town.

Both Mr. Ruston and I have determined, at different periods of the year and in different years, the amount of total daylight in various parts of the town. The method we used was to estimate the amount of iodine set free from a solution of an acid solution of potassium iodide. In 1895, daily tests were made, from the 1st of July to the end of the following February, at three centres—one in Kirkstall Road (an industrial centre), one at the Philosophical Hall (a town centre), and one on Woodhouse Moor (a high open space about a mile from the centre of the town). Without entering into details, it may be stated that, on the average, there is an absorption of one-quarter of the daylight in some parts of the city. Mr. Ruston's experiments were carried out during the month of June of last year at seven stations—six in or round the town and one at Garforth, 7½ miles distant. A comparison of Garforth with Hunslet (an industrial district) frequently showed an absorption of more than half the total daylight. This absorption of light will also affect vegetation.

It is instructive to compare the quantity of soot deposited at different centres with the amount of daylight. The relations, as indicated by the dark and light columns in the following table, show, as one might have anticipated, that the amount of daylight varies inversely as the amount of soot deposited. But the most injurious effects on vegetation are undoubtedly to be ascribed to the sulphurous and sulphuric acids emitted from the burning sulphur contained in the coal. The amount of these acids is given in the table above.



2, Hunslet. 3, Beeston Hill. 4, Philosophical Hall. 5, Headingley. 7, Observatory. 9, Weetwood Lane.

Fig. 2.—Influence of Suspended Matter on Intensity of Light.

In conclusion, Dr. Cohen referred to some experiments conducted by Mr. Ruston on the effects on vegetation of the acid carried down by rain; to its effect on health; and to the questions: "How far outside the town does smoke penetrate?" and "What is the increased cost entailed in the national washing bill?"

The lecture was fully illustrated with lantern slides, many of which were of arresting impressiveness; and Professor Cohen freely left his manuscript to deal with these in detail. Many of these represented work done in co-operation with colleagues in the Agricultural and Botanical Departments. Some of the recently exposed squares of glass were shown with their adhering coat of tarry soot, &c., which the rains of three months had not been able to remove; and the contrast between the squares exposed in the town and those farther afield were more eloquent than pages of numerical data. A slide was shown contrasting twelve months' deposit on such sheets of glass in the heart of Leeds and in the open country near. A telling series of slides showed leaves picked in various parts of Leeds, whose green colouring matter had then been removed and the translucent leaves with their coats of soot, photographed against the light. Even more striking were slides showing the boxes of grass raised under parallel conditions except for the water (equivalent to the local rainfall) given them. Some specimens were watered with varying proportions of sulphuric acid added to pure water, and others with the acid rain found even 7 miles out from Leeds and others with this same rain with its acidity neutralized. Even those of the audience who lived in view of some of the most striking instances of the effect on vegetation of acid rain that the country affords were struck with the effect shown. Most striking of all, perhaps, were some highly-enlarged sections of leaves showing stomata (or pores) blocked with soot, and then views of selected laurel leaves on bushes in various parts of Leeds originally of equal size and then photographed some months later, and showing most forcibly how the soot-choked stomata retarded growth and healthy development.

Mr. W. Cranfield, in proposing a hearty vote of thanks to the lecturer, said that, though they were proud of being "gas men," they were not only "gas men," or "gas men" all the time, and that afternoon had been one of the notable events in their Association meetings, as it had, for a time, lifted them a little out of the ordinary work and topics. He was proud to have the opportunity of bearing testimony to his personal indebtedness to Professor Cohen. He had had the privilege of working as a student under him in years past; and valuable as had been the direct results, the indirect were even more valuable, as Professor Cohen's work, example, and encouragement had been a constant inspiration to him. Leeds had been shown to have an unenviable distinction as regards its smoke-laden atmosphere. But there were even worse offenders in the West Riding; and he noticed that none of their Sheffield members had ventured to appear in the lecturer's presence that afternoon. They really could not overestimate the magnitude and importance of the smoke evil; and although the ways out of the difficulty were not obvious and accepted, yet they did well to keep an ideal before their eyes and patiently to work on in the cause of reform—he would hardly say in order to awaken the public conscience, but, what was much more to the point, in order to awaken public dissatisfaction and so lead to some modified strong law vigorously and impartially administered. He would commend to their notice the truly scientific attitude Professor Cohen had adopted in his reluctance to use statistics and lines of argument that were not absolutely reliable and free from possible accessory causes. His reticence and guarded remarks were a valuable lesson to them, for the gas industry, in common with many others,

had suffered in the past from unreliable data, tables of results from experiments whose conditions were not closely studied and plainly set down, observations imperfectly taken, and large far-reaching conclusions drawn from scanty premisses. He was not sure that some of the recent calculations as to the amount of harm done by smoky domestic chimneys did not come into this category. Anyhow, it was quite in keeping with our English ways to attack the little offender and let the big sinner alone, to draw off attention from the offences of mill and factory chimneys by denouncing the cottage chimneys, or even by gibbetting as prime offenders the London gas companies, who leave a few grains more sulphur in 100 cubic feet of gas than they did formerly. Who should more insistently call public attention to the noble idea of clean, bright, and healthy towns than the men of the gas industry, who had at least the main key to the solution of the present difficulty in their possession?

Mr. J. H. HILL seconded the vote of thanks, and spoke of the ways in which even the smoke cloud had a silver lining for the gas industry. They had seen the results of experiments showing how strikingly smoke curtailed sunlight, so much smoke meant less natural light and more gas needed. His own town of York was hardly a typically smoky one; but they had far more smoke than they wished, and as a private householder his house suffered from neighbouring offenders—including an electric light works. Another way in which the smoke problem affected them was in blackened ceilings. These were popularly blamed on to gas. Of course, they all knew better, and he had greatly enjoyed calling attention to some appallingly black ceilings in some York public buildings where the thought of using gas could not be entertained—it was so dirty. Electricians claimed greater cleanliness for their commodity; but given clean air and comparatively smokeless towns, the cleanliness of gas would not continue to be libelled as at present.

The PRESIDENT, in putting the resolution to the vote, bore tribute to the interest and lucidity of the lecture, and emphasized the importance to all interested in gas of unremitting effort in "booming" their own unequalled fuel.

Professor COHEN, in acknowledging the vote of thanks (which was enthusiastically carried), expressed his gratitude for the patience with which he had been heard, for the personal references, and for their kind vote. His subject might at first have seemed somewhat remote from their industry, but was probably closer to it than many thought; and it would probably be through gas that the solution of the problem would be reached.

SCOTTISH JUNIOR GAS ASSOCIATION.

EASTERN DISTRICT.

The members of the Eastern District Division of the Scottish Junior Gas Association paid a visit last Saturday to the Durie Foundry, Leven, Fife, belonging to Messrs. Henry Balfour and Co., Limited, and to the works of the Leven and Methil Gas Company, Limited. About forty attended.

Visiting the foundry first, they were received by Provost Balfour, of Leven, who is Managing-Director of the Company, and who extended a hearty welcome to the party. A tour of the works was made, with Mr. J. Barker, the Manager, and Mr. J. Hunter, one of the staff, acting as guides. The pattern, moulding, and fitting shops were visited, in the last-named of which there was much to be seen in the interior fittings and methods of putting together gas apparatus. Although a great deal of the power in the machine-shops is derived from gas-engines, part of it is steam power, and in particular there is a venerable steam-engine of 48-H.P., which is about seventy years old, and is still going. A punching-machine, capable of making about forty holes at once in a number of gasholder plates, was shown at work; and in the yard, close by the workshops, the application of the plates was seen in the erection of the crown of a gasholder which is being fitted up, to the order of the Dunblane Gas Company. There was also seen a small coal-gas works, including a retort-bench of two ovens—a three and a two—condensing, washing, and scrubbing plant, and a holder, erected in 1824, and still in use.

When the foundry had been inspected, the party walked over to the gas-works, where they were welcomed by Mr. Andrew Hogg, the Chairman of the Company. Then they were shown a new two-lift gasholder, in steel tank altogether above ground, and spiral-guided upon a design of the builders, Messrs. Henry Balfour and Co., which is now nearing completion. The tank is 75 ft. 6 in. diameter, and 23 feet deep; and the lifts are respectively 69 feet and 67 feet diameter. The capacity of the holder is 158,000 cubic feet. It is proposed to telescope another holder, raising its capacity from 100,000 to 200,000 cubic feet; and when this is done, there will be storage capacity for upwards of 350,000 cubic feet. The maximum daily output of gas is at present 150,000 cubic feet; but it is expected to be nearly doubled in a short time. In the works there are two retort-benches—an old one, containing two ovens of sixes and two of threes; and a new one, containing three ovens of eights, fired on Hislop's regenerative system. For drawing off tar from the hydraulic main, there is a tar-column, which is a most effective piece of apparatus. The gas is condensed in four annular tubes, and then passes through a Livesey washer, a Waller steam-driven exhauster of 15,000 feet capacity per hour, a Creake annular brush scrubber, and the purifiers, which are four in number, 20 ft. by 16 ft. The works have been laid out with a view to the extension of any part.

The inspection over, the visitors were entertained at tea in the Central Café—Mr. J. BARKER in the chair.

The PRESIDENT (Mr. W. Dunlop, of Kirkcaldy) said the members would agree with him that they had had a unique opportunity of gleaning knowledge on matters intimately connected with their every-day work. Messrs. Henry Balfour and Co. were a firm of long standing; and the work they turned out had always been excellent. He proposed a hearty vote of thanks to the Company and to Mr. Readdie for the arrangements he had made for their visit.

Mr. ALEX. WILSON (Glasgow) said it gave him much pleasure to be with them, as he took a great interest in the doings of the Junior Associations, both in the East and in the West. One of the reasons for his presence was that it was in Leven that he started his life-work. He was born there, and served his apprenticeship in the Durie Foundry. He was pleased at going over it, and at seeing the great advances which had been made. The Company had always been noted for turning out a thoroughly sound article. The gas-works they had visited were very complete, and did credit to Mr. Readdie.

Mr. J. R. MOYES (Granton) proposed a vote of thanks to the Leven and Methil Gas Company for showing them their works.

Bailie LAWRENCE, a Director, said the Company started business in 1837, with a capital of £800. In 1846, the capital was increased to £1500; and in 1854 to £1800. Then there was a long halt of forty years. It was then raised to £3600. In 1908, it was brought up to £18,000; and it was now proposed to increase it to £30,000. In 1900, the make of gas was 13 million cubic feet; last year they made 42 millions.

Mr. P. L. READDIE, the Manager, said he began work in the Durie Foundry, where he was a journeyman when Mr. Wilson was an apprentice. He would impress upon young men who were about to enter gas-works to try to get a smattering of engineering work. Everything in their works, he might say, was new within the last ten years; and so they were likely to be able to keep pace with the times.

On the motion of Mr. W. GEDDES (Granton), a vote of thanks was accorded to Mr. Barker, who briefly responded; and the proceedings closed.

Burkheiser's Process for the Recovery of Cyanogen.

The abstract translation of an article by Dr. Bertelsmann which was given under the title "The Burkheiser Purifying Process" in the "JOURNAL" for the 4th inst. (*ante*, p. 23) contained the following statement: "An attempt to recover the cyanogen in the gas along with the ammonia, by converting it into ammonia through the intermediate formation of ammonium sulphocyanide, has not yet attained practical success." Messrs. Burkheiser and Co., of Hamburg, have written to point out that the conversion of cyanogen into ammonia is a perfectly established fact, and it is only the chemical explanation of the process of conversion that is not sufficiently cleared up and worked out. In view of this explanation, it may be well to give a full translation of the words of Dr. Bertelsmann in the "Chemiker Zeitung," the sense of which was intended to have been conveyed in the sentence already quoted from the "JOURNAL." Dr. Bertelsmann wrote as follows: "In addition to the ammonia, Burkheiser will also recover the hydrogen cyanide contained in the gas by first converting it into ammonia. His purifying material changes the hydrogen cyanide into sulphocyanide, which remains in the material in the form of ammonium sulphocyanide. By oxidation the latter then becomes converted into ammonia and sulphur dioxide, thus:

$$NH_4CNS + 3O + H_2O = 2NH_3 + CO_2 + SO_2.$$

This part of the process, however, has not yet been sufficiently worked out (*durchgearbeitet*), and as the formation of ammonia by oxidation will not be quite clear, the author would merely call attention to the oxidation of sulphocyanides with nitric acid according to the German patent No. 97,896, by which sulphuric acid and hydrogen cyanide are produced." Messrs. Burkheiser and Co. point out that, in thus writing, Dr. Bertelsmann meant only that the scientific explanation of the process is not yet sufficiently clear.

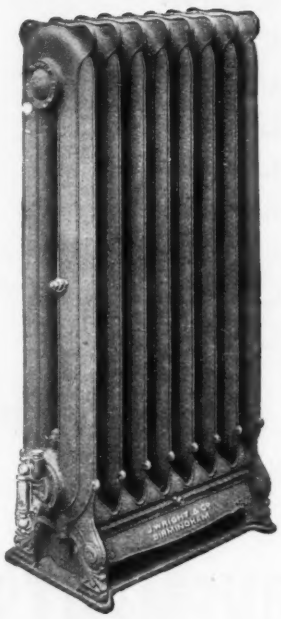
The East Greenwich Gasholders: A Correction.—We regret that the holder illustrated on p. 107 of the last number of the "JOURNAL" was, by inadvertence, wrongly described. It was not the 12 million cubic feet holder erected by Messrs. Clayton, Son, and Co., Limited, but the four-lift one, of 8 million cubic feet capacity, put up by another firm in 1885.

Petrol Air Gas.—Last Wednesday, Mr. H. O'Connor, of Edinburgh, delivered a lecture on "Petrol Air Gas" to members of the Scottish Industrial Art Association. He described and showed in operation the plant for the working of the system known as "Solux," and dwelt upon the safety of the system, if used for the lighting of mansion houses, for which it was very suitable. The lecturer explained that the heat given off by the gas was only one-fourth or one-fifth of that derived from coal gas. He also described the method of supplying it already mixed with air, by which arrangement, when it was burning, it did not abstract oxygen from the air.

The "St. ANDREW"

Gas-Heated

STEAM RADIATOR.



THE FIRST OF ITS TYPE.
THE BEST OF ITS TYPE.

No products of combustion can get inside the loops.

This is essential to the life and hygienic value of a Gas-heated Radiator.

All Cast Iron!
No parts to take to pieces.

YOU ARE SAFE WITH THE PIONEERS OF GAS-HEATED RADIATORS.

JOHN WRIGHT & CO.,

The Radiator Experts,

Essex Works, BIRMINGHAM.

252.

Gas-Fire History.

A CHALLENGE!

WHO invented and popularized the following?

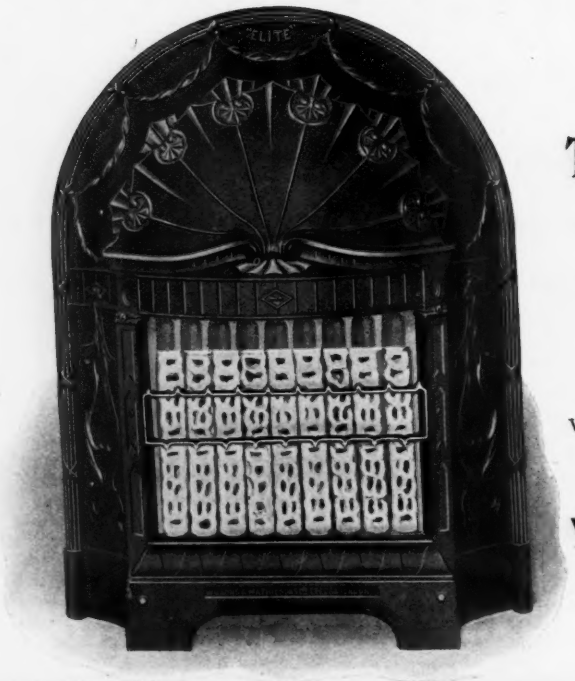
The **DUPLEX BURNER** for GAS FIRES	**WILSONS'**
Pattern of present **UNIVERSAL FUEL**	**WILSONS'**
The **FUEL PLACED UPRIGHT** . .	**WILSONS'**
Flames Burning INSIDE FUEL . . .	**WILSONS'**
The **DOUBLE LENGTH FUEL** . .	**WILSONS'**
The SHALLOW FIRE	**WILSONS'**
The **GAS AND AIR ADJUSTMENT** .	**WILSONS'**
The "VENTURI TUBE" BURNER . .	**WILSONS'**
The "REGENERATIVE REFLECTOR" .	**WILSONS'**
GAS FIRES for Fitting into GRATES .	**WILSONS'**

WHAT would the present Gas Fire have been but for the above improvements?

THIS YEAR'S "WILSON" IMPROVEMENTS

Double "Double" Fuel. **Patent Reversible Duplex Venturi-Tube Burner.**

Patented Reversible Duplex Gas Tap. **Most Artistic Designs Ever Produced.**



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REGISTER OF PATENTS.

Mr. Cowan's Gas-Meter Specification: A Correction.—Towards the close of the abstract of Mr. William Cowan's specification for gas-meters which appeared in the "JOURNAL" last week, the following sentence occurred: "The diameter of the hole E must be so adjusted that it will discharge the quantity of water automatically fed by the spoon-feeding device G, so that when it has filled up to the syphon level, it cannot produce any further rise of level, and therefore brings the syphon A into operation." In the official provisional specification, the concluding words of the sentence were, "and therefore *cannot* bring the syphon into operation." Unfortunately, in the print of the complete specification, from which our abstract was prepared, the word put in italics above was omitted; while in the abstract an unnecessary "s" was added to the word "bring." The sentence should close as in the provisional specification.

Radiation Pyrometers.

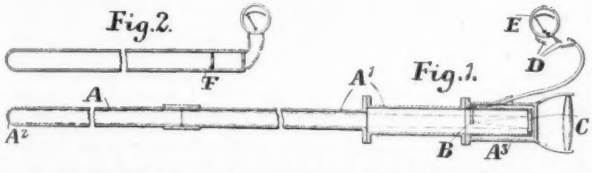
CAMBRIDGE SCIENTIFIC INSTRUMENT COMPANY, LIMITED, and WHIPPLE, R. S., of Cambridge.

No. 21,369; Sept. 18, 1909.

This invention relates to radiation pyrometers—that is, to pyrometers in which the sensitive element is not subjected to the actual temperature of the body whose temperature is required, but to a portion of the radiant heat therefrom, so that the sensitive element is only raised in temperature by a fraction of the true temperature of the body.

The great advantage of radiation pyrometers, the patentees point out, is that, owing to the fact just mentioned, the sensitive element does not wear out rapidly, even though it is used to measure extremely high temperatures. The chief disadvantage in radiation pyrometers hitherto used is that their readings depend not only upon the temperature of the body itself, but upon the nature of the surface of the body and on the temperature of surrounding objects. It is, therefore, in many cases necessary to apply corrections to the readings obtained in order to get true temperatures. Also most types of radiation pyrometers have the further disadvantage that they require focussing on the body whose temperature is being obtained before a reading is taken.

The objects of the present invention are, while retaining the advantage already mentioned of keeping the sensitive element outside the zone of intense heat, to secure the further advantage of avoiding the necessity of applying any corrections to the readings to obtain true temperatures, and also to avoid the necessity of focussing the instrument before a reading is taken.



Cambridge Scientific Instrument Company's Radiation Pyrometer.

As illustrated in fig. 1, a tube A A^1 is employed of definite length and closed at the end A^2, having mounted at the other end a pyrometer head A^3, containing the sensitive element B. A concave mirror C, of short focal length, is mounted in the pyrometer head in such a manner than an image of the inside of the closed end of the tube is formed a few inches in front of the mirror; and the sensitive element is so placed that this image coincides with it. To use the pyrometer, the closed end A^2 of the tube is inserted in the furnace or other body whose temperature is required; the other end of the tube, carrying the pyrometer head A^3, remaining at a comparatively low temperature. The sensitive element therefore has its temperature raised above the temperature of the surrounding pyrometer head by an amount dependent upon the intensity of the heat image formed by the mirror, and therefore by an amount dependent upon the temperature of the closed end of the pyrometer tube. Since for the same pyrometer the concave mirror is always at the same distance from the closed end of the tube, the instrument can be adjusted so that the image coincides with the sensitive element once for all, and will therefore not need focussing or otherwise adjusting each time it is used. Also, since the pyrometer tube will, in practice, be made of fairly small diameter, and will be subjected to the heat of the furnace for a length of several diameters measured from the closed end, the conditions necessary for true black-body radiation from the inside of the closed end of the tube are secured; and the readings will therefore be independent of the nature of the surface of the closed end of the tube.

A variety of different devices may be made use of for the sensitive element. One of the simplest is to use a small thermo-couple as illustrated in fig. 1; this being connected by leads D from the pyrometer head to an indicating or recording millivoltmeter E or suitable current measuring device whose scale is calibrated in terms of the temperature of the closed end of the tube. Other devices might be used depending for their principle of operation on the change of resistance of a wire with temperature, or the expansion of metals with temperature, &c.

The only part of the pyrometer subjected to the full temperature being measured is the portion of the tube A near the closed end A^2. Provision is therefore made for renewing this portion by making the tube in two parts. The renewable end portion A need not necessarily be of the same material or size as the other permanent portion; and while the latter will usually be of steel, the renewable portion may be of steel, porcelain, silica, plumbago, &c., according to the temperature and purpose for which the instrument is used.

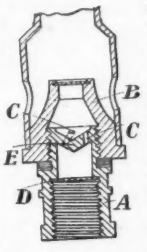
Modifications in carrying the invention into effect would allow a convex lens to be used, although, owing to the fact that such a lens absorbs a large proportion of the heat rays it receives, it would not be so satisfactory as a mirror. Or, as in fig. 2, a diaphragm F may be interposed in the path of the rays to insure that the sensitive element B^1 shall be subjected to a constant definite fraction of the radiant heat proceeding from the hot end of the conduit.

Atmospheric Gas-Burners.

NIESER, E., of Kensington, W., and POLESCHOWSKY, J., of Bowes Park, N.

No. 28,218; Dec. 3, 1909.

This invention relates to connector devices or thimbles to be attached to the gas-fitting at one end and to the burner or nipple containing the gas spit or nozzle at the other end, with the object of securing that the streams of gas issuing therefrom "will not interfere with each other, but will be directed tangentially towards the sides of the chamber and in a whirling manner."



Nieser and Poleschowsky's Atmospheric Gas-Burner.

In carrying the invention into practice, the thimble A is threaded at one end for attachment to the gas-fitting and at the other for screwing into the gas spit or nozzle B. Holes C are drilled in the solid outer or head portion E of the device at different axial angles or tangentially about the centre of the device, so that if (as shown) three holes were made they would serve to direct the three separate streams of gas tangentially and forwardly against the side walls of the chamber formed within the part B. This action imparts to the gas a whirling motion, and effectively breaks the gas up against the sides of the chamber. A gauze disc D (or a perforated metal plate) is arranged in the body of the thimble to assist in the initial breaking up of the gas, and also for protecting the gas-orifices C.

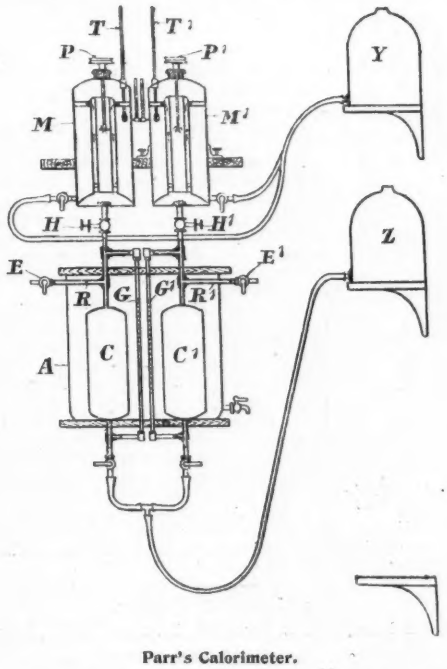
Calorimetric Processes and Apparatus.

PARR, S. W., Illinois, U.S.A.

No. 1329; Jan. 18, 1910.

This invention has for its object to provide a calorimetric process and apparatus in which a standard substance (or substance the calorific value of which is accurately known and readily ascertainable from standard books of reference) is burned under like conditions with the substance under test, "which will give accurate, and therefore reliable, results, and which may be practised and used without peculiar skill."

The heat value of the substance under test is determined in terms of the calorific value of the standard substance; the absolute calorific value of the latter in heat units being known. In the case of gases, the standard gas and the gas under test are burned under identical conditions of pressure, volume, and temperature; and the heat produced by the combustion of each is imparted to equal quantities of water, which are subjected to the same external conditions as to radiation, and the initial temperature of each of which is known. If the rise in temperature due to the burning of the gas under test be represented by t, the rise in temperature due to the burning of an equal volume of the standard gas be represented by t^1, and the heat value of the standard gas per cubic foot be represented by h^1—then the heat value per cubic foot of the gas under test will be $\frac{t\,h^1}{t^1}$. The quantity h^1 will be obtained from any standard work giving calorific values; and the quantities t t^1 will be obtained by observing the readings of the thermometers with which the calorimeters are equipped.



Parr's Calorimeter.

The heat value of a substance may be determined by maintaining equal volumes of water at the same temperature. In the case of gases, the volumes of the standard gas and the gas under test would vary;

and these volumes would be inversely proportional to the heat values of the two substances. Thus, if the volume of the standard gas required to maintain a given temperature in a given volume of water be represented by v^1, the volume of the gas under test required to maintain the same temperature in an equal volume of water to be represented by v, and the heat value of the standard gas be taken as before to be h^1—then the heat value h of the gas under test will be given by $\frac{v^1 h^1}{v}$.

The illustration (p. 205) shows diagrammatically (in sectional elevation) a calorimeter which embodies the invention, and by which the process may be carried out, where the substance under test is a gas.

In the water-tank A are submerged two identical gas receivers C C^1, with which pipes communicate at their lower ends, the flow through which is regulated by taps. Connected with both pipes is one end of a hose, the other end of which is connected to the pressure bottle Z. The upper ends of C C^1 communicate with pipes, from which extend laterally to the outside of the tank the charging pipes R R^1, in the outer ends of which are mounted two taps E E^1.

On a shelf above are two water-heaters M M^1, both jacketed with felt and connected by pipes with the filling or levelling bottle Y. The interiors of the water-heaters are fitted with flues for the passage of the products of combustion. They are further provided with thermometers T T^1, and with agitators P P^1, driven by some suitable device. The water-heater M^1 is provided with levelling screws, by means of which any discrepancy in size between the two heaters may be compensated for by raising or lowering one or the other heater.

In using the apparatus, the tank A is filled with water; and since the volumeters C C^1 are submerged in the tank, the contents of the volumeters will be maintained at the same temperature. By raising the pressure bottle Z from the lowest shelf to the centre one, water flows from the bottle into the volumeters C C^1. The volumeter C^1 is charged, through the pipe R^1, with some standard gas the heat value of which has been accurately determined or is known. Similarly, the volumeter C is charged, through the pipe R, with the gas which is to be tested. By manipulating the valves E E^1, the water-level in the gauge-glasses G G^1 is brought to the same level. The gas in the volumeters will then be under exactly the same conditions as to temperature, pressure, and volume. The filling bottle Y, containing water, is placed upon the top shelf, and water flows from it into the water-heaters M M^1. The levelling bottle Y may be lowered so that the water will drain away and mix in the water-bottle, whereby it is ensured that the initial temperature of the water in both water-heaters is the same. Upon raising the bottle again, the water will, of course, rise to the same level in both heaters; and any discrepancy there may be in the dimensions of the two can be compensated for. In order that the water may be kept constantly circulating, the agitators P P^1 are driven during the test.

On the valves H H^1 being opened and the gases ignited, the flames of the gas heat the bottoms of the water-heaters, and the products of combustion flow through the system of flues, whereby the water is heated. By manipulating the valves H H^1, the water-level in the gauge-glasses will be kept even, and the gases in the two volumeters will be exhausted at the same time. At this moment, the reading of the thermometers T T^1 is taken, and the rise in temperature in each water-heater is noted.

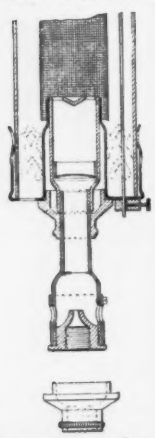
Assuming that the rise in temperature due to the burning of the gas under test from the volumeter C is represented by t, the increase in temperature due to the burning of the gas in the volumeter C^1 by t^1, and the heat value of the standard gas is h^1, the heat value h of the gas under test will be $\frac{t h^1}{t^1}$.

Incandescent Gas-Lamps.

FREISINGER, A., of Berlin.

No. 5844; March 8, 1910.

This invention substantially consists in making the burner gallery, with the incandescence body and chimney, axially adjustable relatively to the burner—that is to say, vertically movable relatively to a stationary burner-head—as shown.



Freisinger's Adjustable Incandescent Burner.

The neck of the burner is externally screw-threaded, and a screwed ring is adjustable thereon. The burner-head is screwed on to the upper end of the neck; while the gallery has a tubular inner part which rests at the bottom upon a shoulder of the ring, and at the top fits closely around the burner-head. By screwing the ring upwards and downwards upon the neck, the gallery is vertically adjusted as desired relatively to the burner.

This axial adjustability of the gallery has the same advantages as have heretofore been obtained by adjusting a burner-head relatively to a stationary gallery, and the gallery is the more accessible of the two parts. It can always be accurately adjusted, so that it does not extend beyond the level of the burner-head. If the gas-pressure is low, the luminosity can be increased, by lowering the gallery, without enlarging the burner orifice, and without lowering the mantle towards the gallery (which, the patentee remarks, involves risk of damaging the mantle). He also points out that "a saving of mantles can be effected, inasmuch as a mantle damaged at the bottom can be lowered with the gallery, and retained in use."

Centrifugal Pumps.

PULSOMETER ENGINEERING COMPANY, LIMITED, and BJÖRNSTAD, J., of Reading.

No. 29,260; Dec. 14, 1909.

This invention relates to centrifugal pumps wherein end-thrust, due to difference of pressure at opposite sides of the impeller, occasioned by unequal leakage of liquid past it, is eliminated by connecting the spaces at opposite sides of the impeller (or at opposite sides of each of a number of impellers in a multiple impeller pump), by passages, through a stationary part of the pump-casing. The object of the invention is to simplify the construction of pumps by connecting the diffuser and casing parts together by hollow screws and utilizing the latter as the means for establishing communication between the chambers or spaces at opposite sides of the impellers.

The invention (which can be variously carried into effect) may be incorporated in centrifugal pumps having one or more impellers with the inlet for liquid on one side only, and provided with means, in the region of the boss, for balancing the end-thrust caused by the inflowing liquid; and its application to such a pump is described in the specification by the aid of diagrams.

CORRESPONDENCE.

[We are not responsible for opinions expressed by Correspondents.]

The Testing of Gas-Fires.

SIR,—Having given some attention to the use of the thermopile as a means for the quantitative measurement of the thermal effect of radiation, I was much interested to read the communication of "Experimenter" in the last number of the "JOURNAL." I do not quite agree with his explanation of the discrepancies to which he refers. The function of a thermopile is to measure the intensity of the radiation at various points of a hemispherical or other form of surface, which intercepts the radiation from a fire. If the thermopile indications were always proportional to the radiation, the objection raised by "Experimenter" would not exist, even with the extreme widths of fires he refers to. I am of opinion, however, that the thermopile readings are not proportional to the intensity of the radiation. I referred to this matter in a paper and subsequent discussion at a meeting of the London and Southern District Junior Gas Association in April and May last.*

In the discussion, it was pointed out that a very large proportion of the radiation which enters the mouth of the conical receiver of the thermopile can only reach the pile by successive reflection along the receiver; but, on account of the taper of the receiver, the rays may, after a few reflections, be reversed, and be reflected outwards. Again, it is easy to show that the proportion of the radiation which reaches the pile by reflection to that which reaches it by direct transmission, will vary with the position round the fire and with the width of the fire, owing to the variation of the solid angle subtended at the centre of the pile by the incandescent surface of the fire. Another feature is that the true centre of the thermopile is an uncertain quantity. The centre of the pile itself is sometimes taken; but there is reason to think that the centre of the large end of the receiver should be regarded as the centre of the instrument, since the radiation is collected there.

In reading through "Experimenter's" letter, I felt that the objections to the thermopile enumerated above were primarily responsible for the discrepancies he refers to.

There is another important point which, so far as I know, has not received much attention—*i.e.*, the necessity for eliminating the error due to conduction of heat into the radiometer from the warm surrounding air. In the paper already referred to, I pointed out this source of error, and explained a method of eliminating it and of avoiding the uncertainties of the thermopile.

I was very pleased to see the subject raised by "Experimenter." It is a highly important one, and, in view of the rapid development of the gas-fire, is well worth careful consideration.

Oct. 14, 1910. J. G. CLARK.

Automatically Lighting and Extinguishing Public Lamps.

SIR,—I would like to reply to some of the statements of your correspondents in the last issue of the "JOURNAL" on the above subject.

I think if Mr. Francks had read my article carefully, he would not have required to use such adjectives as "incongruous."

May I point out that I had no desire, and have none now, to criticize any individual lighter. I tried to deal with the subject generally.

As regards the type of pressure apparatus which uses the whole of the pressure to operate same, and the other type which uses a portion only, the difference is in degree—assuming that both use a bell sealed in mercury. In the former case, the bell is used only to turn the tap; and the inlet and outlet of gas to and from the chamber is effected by other means. The gas pressure has to do two things—lift the bell with its outside mechanism, and, through the agency of the mechanism, turn the tap.

I do not know the weight of the bell; but it requires a certain pressure to lift it. Let x represent that pressure. Now, the pressure required to turn the tap with a margin of safety, may be represented by l. Therefore, it must be quite clear that the apparatus will not work when the pressure is below $x\,l$. I have no exact knowledge of the value of $x\,l$ in the apparatus referred to; but I am quite certain there are plenty of gas-works in this country, and on the Continent, that work with pressures below $x\,l$. Therefore, in those gas-works, this apparatus would be useless.

As regards the other type, which uses a portion of the pressure. As in the former, let x represent the weight of the bell, and l the friction on the valve. In this case, the gas-chamber is always full of gas, and not intermittently so; and the excess of pressure above $x\,l$ has to be balanced by leaden weights.

Generally speaking, the value of $x\,l$ is greater in the former type than in the latter type—partly because the power required to turn a tap exposed to the weather is greater than that required to open or close (for example) a mercury valve.

* See "JOURNAL," Vol. CX., pp. 236, 564.

May I point out that in my article I did not say, nor infer, that there was no limit in the latter type. Obviously there is. An apparatus of a different type that I examined recently operated at about 11-10ths—engaging at about 7-10ths.

As regards the mercury-seal blowing. I described in my article exactly what I have seen, not once, but twenty times. It must not be forgotten that when the apparatus is designed to go under the lantern inside the frog, the size of the latter limits that of the former. Otherwise, new frogs or cradles are required, entailing considerable expense in fixing, and adding to the capital cost of the installation. Thus an extra margin of safety is not always obtainable, and more often than not the bell has to travel more than ½ inch. Of course, where there is no limit in size, you can obtain any depth of seal you choose.

Mr. Francks—referring to my statement that the range cannot be mechanically altered—again misunderstands me. I did not say, nor in any way infer, that the range cannot be altered in any machine, because I know of at least three where this can be done. But it cannot be done in the ordinary apparatus I was describing when I made that statement—*i.e.*, one with a bell sealed in mercury, the operating pressure of which is controlled by weights placed on the bell. Of course, the operating pressure can be altered, as much as you wish. But the engaging pressure is always at a fixed point below the operating pressure; and that range or difference between the two points cannot be purposely altered or adjusted.

I note with pleasure that "Eureka" can light at a high pressure and extinguish at a low one; and, as an alternative, he can extinguish on a rise of pressure, though lower than the lighting pressure. This is entirely a step in the right direction.

I am indebted to "Interested" for his kindly reference to my article. He says: "It would have been of greater utility if I had suggested the lines to be followed (as well as those to be avoided) in any attempt to obtain a satisfactory solution of the problem." May I point out that to do this is tantamount to inventing a lighter. To anyone who is ambitious enough to invent a "lamplighter," the information that I gave in the article must be useful, inasmuch as he will know what to avoid; and this will save him endless experimenting.

As regards the pilot-flame being permanent. I do not think that is necessary. I am informed that in a particular district of a suburban gas company, which is hilly and exposed, the lamps of which have pressure controllers having intermittent pilots, they were watched, among other things, for pilot failures over a period of several months, and, out of 12,800 lightings-up, there have been less than a dozen pilot failures—something under 0·1 per cent.; and these occurred during very heavy gales of wind.

The time of lighting can be accommodated to atmospheric conditions only when it is done by the corporation owning their own gas-works; a gas company, having to work to a time schedule under contract, cannot be expected to take note of the weather.

With regard to the suggestions made by "Interested," I am inclined to think, after reading "Auto Lighter Limited's" letter, that the "Automaton" will meet all the difficulties dealt with in those suggestions.

Oct. 15, 1910. CONTRIBUTOR.

SIR,—The communications on the above subject in your issues of the 4th and 11th inst. emphasize the important fact that the automatic lighting and extinguishing of street gas-lamps has now become a recognized desirability for all gas undertakings, and, moreover, evidence the great progress made by the system in this country and Germany.

Your correspondent "Interested," in last Tuesday's "JOURNAL," points out the main impediment to the rapid and universal adoption of the system—viz., the difficulty of selection from the legion of devices clamouring for favour. This difficulty is so real as to call for an absolutely independent inquiry and the appointment of an advisory body. If this step be not taken, gas undertakings will continue in the present hopeless state of uncertainty and hesitation. Advertisements are of little assistance; and communications to the Technical Press (unless they come from users, giving results from personal and practical experience) often emanate from interested parties, and consitute advertisements for a particular manufacturer or apparatus.

Theoretically, the perfect system is "pressure;" the principle comprising all the desirable attributes. It should (and will undoubtedly) prove equally perfect in practice. The "clockwork" alternative is theoretically wrong, and can never be perfect in practice except under special circumstances and on a small scale.

Ingenuity has produced exceedingly clever clock devices, and enterprise, in the form of advantageous "hiring" terms, has secured their quite extensive adoption. Equal ingenuity has been shown in respect to pressure devices; but the difficulties in this case have been far greater, owing to the wider aims in view.

Of the numerous pressure devices on the market, there are several constructed to cope with all conditions of pressure. One of these has been working successfully for several years. Another has been experimentally proved equally efficient, but as yet has not been in practical use. Other pressure devices, already adopted successfully, have more limited utility.

With such an extensive field, there is room for many varieties; and efficiency and price will be the determining factors. To these characteristics should be devoted the suggested independent inquiry; and the gas industry is wide enough to produce any number of adjudicators possessing the necessary qualification.

The communications in the "JOURNAL" are of great value; but in many cases the remarks of the authors are vague, inaccurate, and misleading. I give the following examples.

Herr Göbrum says: "Pressure ignition effects an economy of about 10s. per lamp per annum." The economy (or saving) depends upon many things, and may vary from 1s. to £1, but will certainly not average (or be "about") 10s. per lamp.

Herr Dobert says: "Only a few tenths are requisite." In this case it would appear that "few" means 12-10ths to 13-10ths, which might mean too much to give in many places; and an apparatus requiring such pressure would be out of court. "The economy in wages and gas effected by the adoption of the system wipes out the expenditure thereon—*i.e.*, capital outlay, interest, and depreciation—in a space of about three years." Whether this be the fact or not must, of course, depend upon the first cost of the apparatus, ranging from (say) 15s. to 60s., and its construction; the latter materially affecting maintenance (or depreciation).

Herr Buhe says: "Pressure ignition does not present advantages for all towns;" "pressure devices may give rise to considerable difficulties in towns of the size of Breslau and smaller." The failure at Breslau was probably not due to the conditions, but to the limitations of the particular device. Moreover, if Herr Buhe were better acquainted with pressure devices generally, he would possibly modify his present opinions.

Finally, the statement by the author of the article on "Automatically Lighting Street-Lamps," that, "almost without exception, pressure lamplighters will only meet one set of pressure conditions," is surely erroneous, and is certainly a damaging remark.

Obviously, then, independent expert knowledge and advice are urgently needed in the interests of all concerned. Automatic lighting and extinguishing means economy in gas, labour, and mantles, and consequently lower competitive price. It also means greater efficiency. Lessened cost, *plus* simultaneous lighting and extinguishing at any hour, means further conquests over electricity.

Oct. 13, 1910. G. W. H.

The Relations of Municipal Gas and Electricity Departments.

SIR,—As you have indicated frankly your full acceptance of the principles on which electricity charges are (or ought to be) based, I have secured the object I had in view when writing.

Your acceptance was all the more welcome because the criticism I have hitherto usually had to meet from those interested in gas undertakings has amounted to an utter negation of the principles now recognized. The criticism has, in fact, been based on the assumption that average costs obtained by dividing total cost of all supplies by total units sold, necessarily gave a cost applicable to any or all supplies. Could anything be more absurd?

Regarding the difference now remaining between us—viz., the application of the principles in everyday practice, I am afraid there is not much to be gained by further correspondence. Neither of us can take a judicial attitude; we are both too interested. I, therefore, merely ask: Is it not evident, in view of the very large power sales in Manchester, that if the wide disparity between Manchester's lighting and power prices had not been based on adherence to the admitted principles, would not financial disaster have occurred long ago? The lighting sales account for only 14½ million Board of Trade units out of the total sales of 71½ millions.

Manchester Corporation Electricity Works, Oct. 10, 1910. S. L. PEARCE, Chief Engineer.

[It would be wrong to say we are sorry not to be able to accept Mr. Pearce's letter as an answer to the comments in our "Electricity Supply Memoranda" of Oct. 4. Principles may be sound enough and acceptable; but their abuse and want of uniform application is another matter. It is the abuse and want of application in the case of electricity supply, that cause complaint. Two or three suggestions were made by us on Oct. 4 that were unencumbered by any complication, upon which we thought Mr. Pearce would fasten in illustrating how fairly, from the standpoint of the central station engineer, the principles that he affects to worship and obey are applied in practice. But our correspondent dismisses the suggestions with the remark: "Regarding . . . the application of the principles in every-day practice, I am afraid there is not much to be gained by further correspondence." That is precisely the point at which electrical engineers usually shunt from the main line of argument in this matter. As to the last question in the letter, and the information given in the final two lines, Mr. Pearce has the advantage of being in possession of certain information that we have not by us. We wonder whether he will favour us by filling up the blanks in the following table, which refers to the sales in the last financial year:

	Sales. Units.		Average Price Obtained.		Revenue from each Source.
Traction . . .	28,526,468	..		..	
Power . . .	28,386,223	..		..	
Private lighting.	14,500,000	..		..	
Public lighting .	144,696	..		..	
Total sale. .	71,557,387	..	Total revenue		£367,702

It will be remarked that the power supply is almost equal to the traction supply. In addition to stating the average price for power, will our correspondent tell us the quantity supplied for power purposes at a lower rate than that for traction, and the various charges for that quantity? We should be interested in knowing, too, the amounts included in the power supply for domestic purposes other than lighting—that is to say for heating, cooking, and so forth; and the prices charged. There is peculiar interest in diving into a matter such as this, where principles and practices are concerned.—ED. J.G.L.]

Inverted v. Upright Incandescent Burners.

SIR,—We have read with much interest the editorial note on "Lighting Efficiency at Low Pressures" in the last number of the "JOURNAL." Indeed, if you had only sung the praises of the inverted burner, without in the same breath lamenting the decay of the upright, his brother, we should have remained silent. But, as we are intimately connected with the manufacture of an upright burner which, as we are defending a principle and not advertising our goods, will remain nameless, you

will allow us to discuss some of the statements put forward in your article.

You say, for instance, that inverted gas-burners are now being constructed "so that their regulation can be effected at any time." But there is nothing new or progressive in this, as there are at least twenty equally good means of quick regulation for upright burners. They are not more generally used because the manufacturers deem it safer not to give inexperienced consumers a possibility of tampering with the regulation, and consequently the consumption, of the burner.

You also contend that "there are burners now, regarded as quite ordinary ones, by which an efficiency, at district pressures, of about 30 candles per cubic foot of gas consumed can be obtained." Your epithet of "quite ordinary" is not over-flattering to that excellent concern which has but lately secured some important contracts for public lighting, and which claims only an efficiency of 100-candle power per 3½ cubic feet, or, roughly, 28 candles per cubic foot, for its standard inverted burner, rightly considered to be one of the most efficient, if not the most efficient, of its type on the market. Now, we are positive that among the numerous makers of upright burners one at least is prepared to guarantee 28-candle power per cubic foot as a minimum (30 or 32 candles being currently obtained), and this even at the low pressure of 7-10ths, as has been proved in the lighting of Palermo, in Italy, recently carried out.

We do not wish to reopen the discussion upon the advantages of the inverted as compared with the upright burner. There is room for both under the wings of the gas companies. The inverted burner which throws a powerful light on a restricted surface immediately beneath the burner itself, leaving the rest of the room in comparative gloom, is excellent for a watchmaker, for instance; it might even be preferred for street lighting, in view of the curious way in which automatic tests are conducted in this branch of lighting. But for a shop or for a living-room, which must be pleasant and cheerful, where there must be a whole atmosphere of light as well on the upper parts of the walls as on the ceilings, there is nothing that will beat the old upright burners.

As for the inverted gas-burners "practically sweeping all before them," are you aware that less than a month ago the upright burner—the same that shall remain nameless—obtained in open competition the lighting of the streets of Madrid? Do you know also that the burner in question, a high-priced one, has been manufactured for the last seven months at the rate of 2000 a day—a figure which we are ready to substantiate; the quantity being insufficient to meet the demand? Also that, though we offer to buy back our old burners at 50 per cent. of the selling price, not one of these has been returned. We therefore think it advisable to make it clear that many people keep their upright burners because they realize that the change to inverted would not be any improvement, and merely replace them when worn by other upright burners of a more modern type, such as are to be found, and for which the manufacturers claim an efficiency more than equal to that of the best inverted burners.

We think you will now agree with us that this type of burner, which you consider as moribund, on the contrary enjoys very good health.

Imperial Buildings, E.C., Oct. 13, 1910. J. MARSE AND CO.

[Our correspondents must have been looking at the short editorial article on "Lighting Efficiency at Low Pressures" through eyes and glasses that considerably distorted the words employed. We cannot see in what we wrote any "lament" regarding the "decay" of the upright burner. "Decay" suggests a falling away (in relation to a burner) from the state of efficiency to which it had attained. Our words were: "Little or nothing is heard in these days about improvements in the vertical type of incandescent burner. Whether there is merely a marking of time in relation to them, or whether we have reached the limit of their susceptibility to advance in point of efficiency, is not a matter we need here stop to discuss." Surely there is nothing that can be construed into "decay" there. Regarding the second paragraph of the letter, if our correspondents had burnt their fingers in using the regulating arrangements above the flames of some of the older types of inverted gas-burners, there would have been immediate appreciation of the improved facilities to which reference was made by us. As to the next paragraph, "that excellent concern" to which reference is made are the possessors of a burner that will give an efficiency of 30 candles per cubic foot of gas consumed at district pressures; and their "claim" to a rather lower efficiency per cubic foot for their street-lighting burners is based on commendable prudence. We have already expressed in the "JOURNAL" our opinion regarding the vertical burner in which our correspondents are interested; and there is nothing to retract now. Time has given confirmation. We also quite agree that there is room for both vertical and inverted burners "under the wings of gas companies;" but why we should be charged with considering the former "moribund" entirely passes our comprehension. Concerning the remainder of the letter, the views of our correspondents may be left without comment to the judgment of technical readers.—ED. J.G L.]

Improved Lighting and Heating of the Burton-on-Trent Market Hall.—The following paragraph appeared under the heading "Talk of the Town" in the "Burton Daily Mail" last Thursday: "The decision to improve the heating and lighting of the Market Hall will be received with approval not only by the stall-holders, who have a right to decent comfort in view of the tolls they pay, but by the public generally. In winter evenings, shopping in this building has frequently been the reverse of comfortable; and visitors to the town, who, chilled to the marrow, have gone into the hall expecting to find warmth as well as bargains, have been grievously disappointed in the former respect."

MISCELLANEOUS NEWS.

A NEW GASHOLDER AT EXMOUTH.

A large number of shareholders and others interested in the Exmouth Gas Company assembled at the works last Thursday afternoon, when a new gasholder which has been erected by Messrs. Willey and Co., of Exeter, was formally inaugurated. The holder has a capacity of 300,000 cubic feet, and is in two lifts; the diameter being 100 feet, and the depth of each lift 20 feet. The tank is constructed of wrought steel plates, and stands 20 feet above the ground-line. It is 102 feet in diameter, and has a chequered steel platform, 2 feet wide, round its top edge, with a suitable hand rail. The guide-framing consists of 16 cantilever standards, constructed of 7 in. by 3 in. channels, braced with steel bars and connected together by two tiers of latticed girders. The height of the structure, which is of steel throughout, is 65 feet.

Among those present at the ceremony were the Chairman of the Company (Rev. C. R. Carr) and the Directors; Mr. Percy S. Hoyte, Engineer and Manager of the Plymouth and Stonehouse Gas Company, who has acted as Consulting Engineer to the Exmouth Gas Company; Mr. J. T. Foster, the Manager and Secretary; Mr. F. Templer Depree, Chairman of Messrs. Willey and Co.; and Mr. H. J. Long, Chairman of the Exmouth District Council. Mr. Hoyte explained that the provision of a new holder had been rendered necessary by the rapid way in which the business of the Company had developed. Hitherto, they had storage for only 130,000 cubic feet of gas; while the output in winter had reached as much as 250,000 cubic feet in 24 hours. In these circumstances, a new holder was an absolute necessity. The structure had been thoroughly tested; and the Contractors and the Gas Company were to be congratulated on a thoroughly satisfactory piece of work. Mr. Depree then called upon the Chairman of the Company to turn the gas into the new holder. The Rev. C. R. Carr did this, and remarked that the business of the Company was growing in a very gratifying manner. They looked for further extensions in the neighbourhood; and now that they had a sufficiency of storage, they would be in a better position to make such developments as were needed.

HOLBORN PUBLIC LIGHTING.

A Petition to the Borough Council.

At the Meeting of the Holborn Borough Council last Wednesday, as the result of a strenuous canvass of the inhabitants of the borough by the electrical industry, following the announcement of the Gaslight and Coke Company's terms for the public lighting, a petition, which it is claimed was signed by 2671 persons, was presented. The petitioners, who were represented by only four persons (the spokesman being Mr. A. W. Gamage, of Holborn), asked for improved lighting in the main thoroughfares—viz., Holborn, High Holborn, and New Oxford Street to its termination at Tottenham Court Road. They also protested against the contract for lighting the borough being handed over for ten years to the Gaslight and Coke Company without inviting tenders from the other three Companies having lighting powers in Holborn.

Mr. GAMAGE, in introducing the deputation, said he did not think it was advisable to give such a large contract without getting other schemes and prices; they therefore asked that the whole matter should be reconsidered by the Council. With regard to the Gas Company's offer, ten years was too long, as so many changes were taking place. In electric lighting they had lately had the advent of the metallic filament lamp, which had proved a saving of 70 per cent. on carbon lamps; and these metallic filament lamps had dropped considerably in price. If they put up the contract to open competition, they would get light at a much lower rate. He maintained that the electric light was more penetrating in fog than gaslight.

Several members of the Council expressed dissent.

The MAYOR (Alderman Max Clarke): No; that is not so.

Mr. GAMAGE (continuing) said it had been stated that trade followed the flag; but he would say that it followed the light. Light meant prosperity for the people of Holborn. He had only to contrast this thoroughfare with Oxford Street; it was like stepping from darkness into sunshine. It was freely admitted that Holborn was badly lighted. He had visited the principal commercial cities of the world, and as regards lighting Holborn was far behind even the smallest of them. It was the duty of municipal authorities to look after the welfare of tradespeople, because if these were prosperous the borough would benefit. In his opinion, the borough could be made the lightest in the Metropolis at the lowest cost.

The MAYOR promised that the matter would receive the consideration of the Council, who, he pointed out, had not given the contract to the Gas Company for any number of years.

Mr. GAMAGE said he thought this was so.

The petition was referred to the Works Committee for consideration and report.

EDINBURGH PUBLIC LIGHTING.

Annual Report of the Inspector.

We have received the report of the Inspector of Cleaning and Lighting to the Corporation of Edinburgh (Mr. Geo. A. D. Mackay) for the year ended the 15th of May, and extract the following particulars.

In his introductory statement, Mr. Mackay says that in connection with the incandescent gas lighting of the streets there is practically nothing of outstanding interest that falls to be reported for the municipal year now under review. The system of half-lighting authorized by the Council in the interests of economy in 1907, is still in operation

during the summer months; and this means that from May 1 to Aug. 31 only half the lamps were lighted. From Sept. 1 to April 30 full lighting obtained up till midnight, when every alternate lamp was extinguished. Though complaints as to want of light were hardly so rife as in previous years, he draws attention to the fact that, notwithstanding that the public have had ample time in which to get accustomed to the changed conditions, considerable dissatisfaction still exists; and a large number of communications have been addressed to the department by citizens, raising strong objections to the half-lighting system. The Inspector's opinion is that partial darkness of the streets causes considerable inconvenience, and is anything but conducive to the safety of life and property.

On the 15th of May last, the streets of the City were lighted by 10,293 incandescent gas-lamps, 1229 electric arc lamps, and 22 electric incandescent lamps. In the previous year, the number of gas-lamps was 10,242; and the increase of 51 is accounted for by additional lighting in areas on the outskirts of the city, &c. The number of electric arc lamps has been increased by 26. The 10,293 incandescent gas-lamps have a varied consumption, particulars of which are as follows: 386 have 2-feet, 9717 have 2½-feet, and 190 have 3-feet burners. The Inspector says the 2½-feet burners give every satisfaction; and as those at present consuming 3 cubic feet become worn out, they are being replaced by the 2½-feet size.

As to the automatic lighting and extinguishing of public gas-lamps, Mr. Mackay remarks that, though some corporations have in part adopted this system, Edinburgh has so far done nothing in the matter. The Gas Commissioners, it may be noted, however, asked leave in January to carry out experiments on the public lamps at Seafield Road, Portobello; and permission was granted, on condition that the department was put to no inconvenience or expense in connection therewith, either now or at any future stage.

An offer of the Gas Commissioners to convert the flat-flame burners in the common stairs into incandescents, to maintain the lights in efficiency, and to extinguish them at sunrise, was accepted. The agreement is for 3½ years. The incandescent burners to be provided by the Commissioners are to be rated to burn on an average 1 cubic foot of gas per hour; and the pressure of gas is not to be less than 18-10ths, or such higher pressure as is necessary for efficient incandescent lighting—the candle power being under normal conditions equal to 16 candles or thereby. During the subsistence of the agreement, the Corporation are to pay to the Commissioners monthly a sum equal to 17s. 6d. per annum per jet, which sum shall be in full payment for the gas supplied and the fitting up, maintenance, and renewal of the incandescent installation, and extinguishing the lights, and generally of all obligations undertaken by the Commissioners under the agreement.

The following is a summary of the expenditure on public lighting for the year under review:—

Street gas lighting, including cost of gas, with lamplighters' wages and incidental expenses .	£18,709	2	10½
Electric lighting, including incidental expenses .	11,541	5	7
Stair lighting, including gas, wages, and other expenses	11,046	5	5
Total	£41,296	13	10½

The expenditure for 1909-10, compared with that of the previous year, shows a decrease of £5669 1s. 10½d. This saving is accounted for partly by the fact that the contributions to the cost of conversion of the flat-flame gas-lamps to incandescents are now completed, and therefore the third and last instalment, which was included in last year's expenditure, drops out of that for this period. Then there was a saving under the headings of pillars, lanterns, &c., and workshop expenses, due to the number of new lamps erected being considerably less than last year, and to fewer mantles, &c., being used; and owing to difficulty experienced in getting burners satisfactorily adjusted as to consumption of gas, the conversion of the remaining upright burners to inverted had to stand over.

Mr. Mackay gives tables showing the progress of electric lighting from 1895-6 onwards and of street gas lighting from 1891, as well as the variations in the gas-rates during the latter period. The value of the lighting plant, as returned to the City Chamberlain, on the 15th of May last, was £20,066 13s. 7d.

GAS v. ELECTRICITY FOR PUBLIC LIGHTING.

Several references have been made in our "Electricity Supply Memoranda" to the letter which Mr. H. B. Renwick, the Chairman of the Electric Supply Publicity Committee, has been sending to the newspapers all over the country with the view of showing that London is an electrically lighted city, so far as the public lamps are concerned. The letter was published in the "Shields Daily Gazette" a few weeks ago; and it has now been answered by a well-informed correspondent, whose letter appeared last Wednesday. In the course of it, he made the following remarks.

The London County Council (including the City of London) have, according to their official statistics, 150,313 public lamps apportioned as follows: Arc lamps, 8825; incandescent electric lamps, 14,489—total, 23,314. They have also gas-lamps (as per the Board of Trade returns), 126,999. There are, therefore, 103,685 more gas-lamps than electric lamps, or, in other words, there are 5·4 gas-lamps to 1 electric. Certain of the local authorities owning electric lighting stations have apparently adopted electric street lighting in all or part, in order to bolster up their undertaking. In the City of Westminster, where they are now converting 71 existing electric arc lamps to high-pressure incandescent gas-lamps, the City Council are satisfied that they will get better lighted streets at a much cheaper cost to the ratepayers with incandescent gas as against electricity. Mr. Renwick evades the fact that the Electric Light Company quoted for a continuation of electric arc lamps and for the conversion of the whole of the incandescent gas-lamps in the City of Westminster (the contract for which expires at the end of the current year) to electricity, but were defeated by the Gaslight and Coke Company's quotation, which was about 77 per cent. cheaper.

Mr. Renwick proceeds to show that Marylebone, in adopting electricity for street lighting, has effected during the past year a saving of £1550 in respect of a portion of their area only. But he does not state that Marylebone owns the electric light undertaking; and that if they had adopted the new inverted incandescent gas-burner lamp they could have effected an annual saving, based on the Gaslight and Coke Company's recent tender to the Holborn Borough Council, of £2892—*i.e.*, £1341 per annum more than by adopting electricity, while the capital expenditure necessary would have been considerably less because the existing gas-lanterns could have been made adaptable to the inverted burner.

The truth is that electricity at present prices cannot compete with incandescent gas for public lighting in point of cost, light for light; and Local Government Board Inspectors have specifically stated this on several occasions. In these days of heavy rates, it behoves local authorities to adopt the budding town councillors' stereotyped phrase, "Efficiency combined with economy," in its fullest meaning; and incandescent gas public lighting is a case in point whereby this object may be attained in reality.

METER-RENT CHARGES AT SALFORD.

The re-imposition of meter-rents by the Salford Corporation is evidently keenly resented by many of the consumers; and the members of the Town Council seeking re-election this year are being severely heckled on the subject at the ward meetings. Many householders who have not followed closely the proceedings of the Town Council were surprised to find in the past quarter's gas bill a charge made for meter-rent, and have written letters of protest to the department.

It was at the June meeting of the Council that it was decided, by 25 votes to 18, to re-impose meter-rent charges. At the previous meeting, the proposal had been rejected; but at a subsequent General Purposes Committee, it was resolved (after an explanation had been given by the Mayor and Alderman Phillips, the Chairman of the Gas Committee), that it was necessary the charge for meter-rent should be re-imposed. It was in 1893 that the Gas Committee abolished this charge; and the necessity for its re-imposition was brought about mainly by the increased demands on the Gas Department in the way of grants in relief of rates and the advance in the cost of coal. At the same time, it was decided to reduce the quantity of gas supplied for a penny to automatic meter users—the alternatives being to increase the price of gas or raise the rates.

In the course of an interview on the subject, a member of the Salford Gas Committee said there were something like 69,000 meters in use under the Corporation in Salford; and these cost thousands of pounds to provide and maintain. "Many of these meters," he added, "are on premises where electricity is used; and they are maintained there simply for the purpose of meeting a failure of the electricity supply. The Gas Committee, therefore, consider that, having regard to what is expected from them in the way of relief of rates, a small charge should be made to those having meters upon their premises. In a large number of cases, the meters are not in any sense of the word revenue producers; and the scheme was decided upon as an alternative to increasing gas prices."

CHESTER GAS COMPANY'S PROFIT-SHARING SCHEME.

Nine Years' Successful Work.

The general meeting of profit-sharing employees of the Chester Gas Company was held lately, under the presidency of Mr. J. G. FORD, the Chairman of the Company, who was accompanied by the Secretary (Mr. F. A. Pye) and the Engineer (Mr. J. C. Belton).

The ninth annual report of the Profit-Sharing Committee, covering the twelve months ended the 30th of June last, was presented. It set forth that the scheme of co-partnership had entered its tenth year; and a hope was expressed that a renewed effort would be made to ensure that before its close every eligible employee would not only be a profit-sharer but also a co-partner in the concern by becoming a holder of stock. The bonus added for the past year was £289, with £22 interest. The total standing to the credit of the employees on June 30 was £858; and £140 of the Company's stock was bought during the year at a cost of £157. The total purchase of stock since the commencement of the scheme amounts to £880.

The CHAIRMAN, in moving the adoption of the report, expressed his pleasure at seeing that the balance shown in the accounts was £100 more than it was four years ago, when he first submitted a report. There were, however, other results which might not be so apparent, but which had a still more permanently beneficial effect, among which the finest was the stimulus afforded to personal interest in the success of the undertaking which afforded them employment. At the risk of repetition, he would emphasize this point. Profit-sharing, leading to, and comprising, co-partnership, stood or fell on the realization of the feeling of ownership—that was to say, that employees were working for the benefit of their own business. Let it once be accepted as simply a part of the daily wages or deferred payment of wages, and then its life would be short. It was dependent on their collective and individual interest in their work—an interest which must be expressed by an effort to secure the best obtainable results. The Company's employees might be roughly divided into outside and inside men; and the clerk or workman outside must realize that he represented the Company, and could improve or damage its reputation by the character of his work and the civility and intelligence he displayed in its execution, while the clerks and men in the offices or works could quite equally do their share with those who met the Company's customers outside. It would be observed from the report that they had entered the tenth year of their profit-sharing scheme; and he most earnestly hoped they would individually brace themselves up with the determination that the next report would quite eclipse all its predecessors. One of their principal

objects was to enable all the employees to become co-partners by purchasing and holding stock; they still had sufficient on hand to meet all likely inquiries.

Mr. J. R. MACHIN, in seconding the motion, said the report must be a great encouragement to the employees to avail themselves of the opportunity offered for participating in the profit-sharing scheme. It was nine years since their first meeting was held; and he well remembered some talk in disparagement of the scheme at the beginning, when it was thought it would exist for only a few days, or perhaps a year or two. In spite of the cold water poured upon it, the scheme was still boiling, and he believed would keep on doing so.

The report and accounts were adopted.

A vote of thanks having been accorded to the officials and others for their voluntary work in connection with the scheme last year,

Mr. CROSBY, in acknowledging the compliment, expressed the thanks of the employees to the Directors of the Company for instituting the profit-sharing scheme, which he trusted might have a long career. It behoved them to put forth renewed efforts to secure its continuance. If only for the benefits it had conferred in cases of sickness and death, he thought the scheme had justified its existence.

On the motion of Mr. BELTON, seconded by Mr. PYE, a vote of thanks was accorded to the Chairman.

The CHAIRMAN, in reply, expressed the hope that next year he would meet a larger number of profit-sharers.

FATALITY TO A STOKING-MACHINE DRIVER.

Last Wednesday, Dr. Ambrose, the Coroner for the Metropolitan District of Essex, held an inquiry, at the Barking Town Hall, into the circumstances attending the death of George Robinson (44), a machine-driver. It occurred at the Beckton station of the Gaslight and Coke Company, on the previous Saturday.

Mr. W. C. BEASLEY ROBINSON (Messrs. Monier-Williams, Robinson, and Milroy) appeared for the Company; Mr. R. C. BELTON attended on behalf of the widow and family of the deceased; and Mr. C. F. HUNTER, one of His Majesty's Inspectors of Factories, represented the Home Office.

Mr. *J. N. Reeson*, the Engineer and Manager of the Beckton station, produced some photographs of the place where the accident occurred. He said the two retort-stoking machines concerned were some distance apart when deceased was found. The left-hand one was for pushing the coke out, and the right-hand one for putting the coal in. The former worked in advance of the latter at a distance, on an average, of 20 to 30 feet, so as to clear the retorts in time for the machine that was following. Both the machines were worked by compressed air. He had never known one to be drawn by another. On the day of the accident there was some slight defect in the motive power. On starting, it was off the discharging-machine, owing to the pressure-pipe having broken; and the man in charge should have waited for it to be put right, which would have been a matter of only a few minutes. Apparently the deceased looked about for some means of coupling-up the two machines, and eventually found a piece of sling chain which was used for connecting the shoot on the other side of the machine. He then fixed the hook of the chain between the nut and the frame of one machine, and put the ring of the chain over the projecting nut on the frame of the other. To do this, he had to put one foot on the guard of one machine, and the other foot on the guard of the wheel of the second machine; and then he got his head fixed between the framing of the two. The usual thing, when pipes went wrong, was to wait till the fitters came to put them right. Had the deceased done this, the accident could not have happened. It was not his duty to do anything but drive the machine; and what he did was entirely on his own initiation. There was a definite rule that if anything went wrong with a machine the workman should report it to the foreman, who would attend to it.

Edward Gentry said the discharging-machine of which the deceased was driver was stationary at the end of the retort-house on the Saturday in question. He was on his machine when Robinson called to him to "just move up steady;" and at the same time he fixed a chain on to his (witness's) machine as well as on his own, holding on with both hands—one on each machine. He (witness) moved the machines about 10 feet, and did not know that anything had happened until he saw the deceased lying face downwards between them, with blood oozing from him. The deceased could not move the machine by its own power, because the pressure-pipe was broken, and he was waiting for it to be repaired.

By the JURY: He could not tell why the deceased wanted to move the machine. There was no object in it, so far as he knew. The men were waiting to charge the retort.

Joseph Charles Ross deposed to seeing deceased attach the chain to the machines and Gentry start one. So far as he was aware, they both started very steadily. He did not know there had been any accident until he saw the blood, and then he went to Robinson's assistance. He had been three years on the works, and had never seen such a thing before.

Samuel John Allsop said he saw the fixing of the chains, and it seemed to him that the face of the deceased was between the frames of the machines. He thought it was hardly safe; but he did not warn him. He saw the charging-machine pulling the other, but did not know any accident had happened until Gentry called out that Robinson's head was "pinched." He had been on the works since the house was first started, but had never known the machines to be used for the purpose of pulling each other along.

George Day, foreman of the retort-house where the accident happened, said no report was made to him on the day in question about anything being wrong. He was there when the pressure went off. The pressure-pipe broke, and the air escaped. He at once sent for a man to repair

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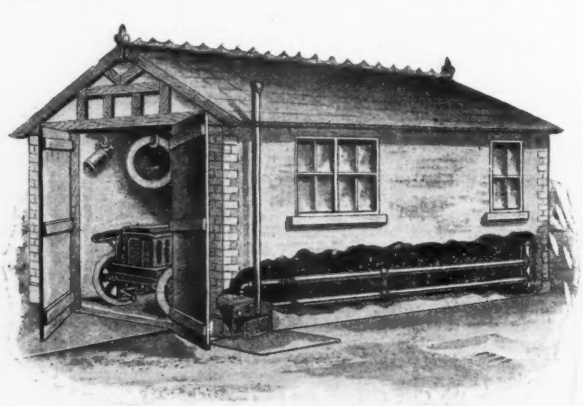

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TWO SIZES.

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it; and this would generally take from ten to fifteen minutes. There was no reason why the deceased should want to move his machine. There was no hurry at all for the retorts—in fact, they could have waited for an hour or even two hours, when they came down for the next charge.

Dr. *John Guest* said the deceased was a very healthy man, every organ of the body being sound; and there was no question of any sudden illness which threw him forward. The cause of death was shock caused by the pressure of the machines upon his head.

The CORONER having addressed the Jury, they consulted for a short time and returned the following verdict: "The Jury have agreed that they think this man met his death accidentally; but they are of opinion that he was doing his best to expedite the work while the machine was out of order." They added a rider to the effect that something should be fixed on the machines in the way of buffers, so that it would be impossible for them to come close together, or that an accident of this kind should occur again.

Mr. ROBINSON: There is a buffer on.

The CORONER: But if you had a buffer say 18 inches long?

Mr. REESON: They would most probably get their bodies in between the buffers.

The CORONER said he thought they might safely leave this matter to the Factory Inspector and Mr. Reeson.

Mr. REESON said the Company were most anxious to do everything to protect the lives of their workpeople.

The CORONER said the verdict was one of "Accidental death."

SALES OF STOCKS AND SHARES.

In accordance with the announcement which appeared in our advertisement columns, Messrs. A. & W. Richards offered for sale, at the Mart, Tokenhouse Yard, E.C., last Tuesday, by order of Directors, four new issues of gas and water capital. The first lots consisted of £1000 of 4 per cent. perpetual debenture stock of the Great Yarmouth Water Company; and the stock was all sold at £105 per £100. Some lots of the Company's new ordinary stock, which ranks for a maximum dividend of 7 per cent. per annum, and will bear one of 4 per cent., followed, and were sold at from £92 10s. to £94 per £100. An issue of £10,000 of "D" capital water stock of the Barnet District Gas and Water Company was next offered. This is a 7 per cent. stock, on which 5¼ per cent. per annum has been paid for the last eight years; and it was all sold at from £114 10s. to £118 per £100. A parcel of 500 £10 "C" shares (7 per cent.) in the Harrow and Stanmore Gas Company, ranking for a dividend of £7 7s. per cent. per annum as from the 1st prox., fetched £15 2s. 6d. to £15 15s. each. A new issue of "C" consolidated 5 per cent. stock of the Aldershot Gas, Water, and District Lighting Company was sold at from £101 to £105 per £100; while some 4 per cent. consolidated preference stock fetched £94 to £95 per £100. At the Bank Auction Mart, Bristol, Messrs. John E. Pritchard and Co. (successors to Messrs. Alexander, Daniel, and Co.) recently sold, in accordance with the announcement which had appeared in the "JOURNAL," £15,000 of the Bristol Water Company's 7 per cent. maximum consolidated ordinary stock. The reserve was £136 per £100 of stock; and the prices realized ranged between £138 and £139. The total amount obtained by the sale, which lasted only fifteen minutes, was £20,748 5s.; and the average price of the stock was £138 6s. 5d. Tenders invited by the Sutton District Water Company for an issue of £10,000 of 4½ per cent. preference stock were opened last Thursday. They amounted to £16,150, at prices ranging from £120 to £120 15s. per £100 of stock; the average price obtained being £120 12s. 2d.

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

The gas transfer at Kirkcaldy has been lost sight of for a time. It was thought that the parties would be able to come to terms in a private way. This expectation, however, is not in course of being realized, and the belief is almost universal that it will never be, but that the proceedings will follow the usual course of a disputed arbitration. The situation is somewhat complicated by an action which has been brought before Lord Dewar in the Court of Session by the Kirkcaldy Gaslight Company against the Provost, Magistrates, and Councillors of the Royal Burgh of Kirkcaldy. The particulars of this litigation have not been disclosed; but one thing about it is known—viz., that it has to do with a claim made by the Corporation to have discount in respect of gas consumed in the public lamps. At a meeting of the Town Council this week, it was reported that the Law Agent for the town—Mr. J. Prosser, Writer to the Signet, of Edinburgh—had consulted Mr. J. Avon Clyde, K.C., on the subject. The proposal was made by the Committee who have had charge of the negotiations regarding the gas transfer that a small Committee should be appointed to advise Mr. Prosser in the conduct of the case. In speaking against the proposal to appoint a Sub-Committee, Mr. Mackinnon said the whole question turned upon the meaning of the word "private." In a circular issued by the Gas Company in 1906, interest and discount were offered to private consumers. When the question first came before the Council, the Town Clerk gave his opinion against the town. Mr. Clyde's opinion was directly against the Council. The case simply turned upon what was public and what was private lighting. The Company maintained that the Town Council represented the public, and that whatever gas was given to the Council for the purpose of street lighting must be considered public. Mr. Mackinnon got no support; and a Sub-Committee of three was appointed. After this, there was a long discussion upon a proposal, which emanated from the Gas Committee themselves, that a Sub-Committee should be appointed to

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House Heating a Speciality, and the "Daisy" Boiler now
drop" which has proved so popular. Approximate consump-
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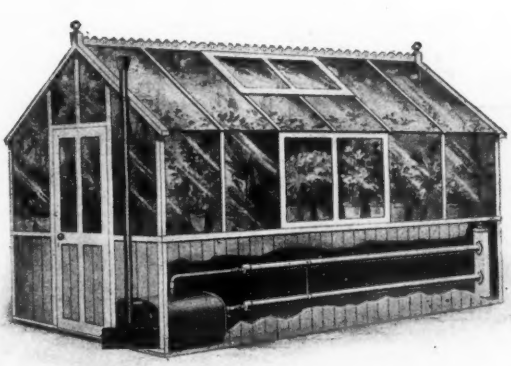
found the best Material for Boilers of this class, and
EFFICIENCY, ECONOMY, and RELIABILITY.



For Green-Houses and Motor-Houses.

TWO SIZES.

Suitable for connection to Hot Water Radiators, or to Pipes as shown.

London Offices and Show-Rooms: 132, Queen Victoria Street, E.C. General Offices and Works: Warrington.

act along with Councillor Wright and Mr. Prosser in the matter of the gas arbitration. Mr. Wright was opposed to the appointment of a Sub-Committee, as he had taken the responsibility in the negotiations all along; and it was resolved to send the matter back to the Gas Committee to consult with Mr. Prosser, and judge as to whether an Advisory Sub-Committee should or should not be appointed. In the course of the discussion, Mr. Wright said he had the assurance of their legal adviser that within a period of three months the whole thing would be settled. He also stated that, in consequence of Mr. Silverthorne having been appointed Arbiter on behalf of the town, it was illegal to consult him any further upon the subject of the arbitration. But the matter could not be more fully explained while the arbitration was going on. The Council would appear to be in want of a technical adviser, having lost the services of Mr. Silverthorne. The Company have secured the services of Mr. W. R. Herring, of Edinburgh.

On Monday, the Town Council of Dunfermline had before them the subject of supplying gas to Kingseat, an outlying village. Mr. T. Stewart, the Convener of the Gas Committee, said they estimated that the cost of laying a gas-main and making connections would be £1300. They anticipated that they would get 200 customers; and assuming that these used, on an average, 8000 cubic feet of gas, the total consumption would be 1,600,000 cubic feet per annum. Sinking fund and interest charges on £1300 would amount to 1s. 8d. per 1000 cubic feet, which would be charged above the price in Dunfermline. In other words, while gas was being supplied in the burgh at 2s. 3d. per 1000 cubic feet, in Kingseat the price would be 3s. 11d. Three-fourths of the people in Kingseat were burgh ratepayers, and the other fourth were in the county. Burgh ratepayers in the village would naturally object to pay more for gas than the price charged in the burgh. Unless the Council were prepared to supply gas in Kingseat at 2s. 3d. per 1000 cubic feet, the Gas Committee did not see how it was practicable to go into the matter at all. In the Council, some doubt was thrown on Mr. Stewart's calculations—his estimate being considered by some to be exaggerated; and the subject was sent back for a report upon it by the Gas Manager.

In the Arbroath Town Council this week, it was reported that, owing to disputes and breakdowns at the collieries, there was likely to be delay in the delivery of the Banknock coal contracted for, and that the Manager recommended acceptance of an offer by the Lothian Coal Company, Limited, to supply another 1000 tons of Newbattle single nuts, for delivery this season, at the contract price of 11s. 2d. per ton. The recommendation was adopted.

The important subject of liability for damage to pipes by underground mine workings was before the Town Council of Hamilton on Tuesday. The Town Clerk read the opinion of Counsel, which was obtained in 1884, and which was to the effect that, although the Town Council were entitled to vindicate for the surface of the streets the ordinary measure of support from subjacent owners, there was no liability on mineral owners for damage to pipes, but that if there were a case of undoubted subsidence of the roadway and damage to pipes therein, an action might be raised against the parties working the minerals, for declaration that the Council were entitled to support, both for streets and pipes; that no liability rested on mineral owners to pay compensation for damage to water-works and railway undertakings, but that the owners of these were empowered by statute to purchase the minerals in order to protect their works. No such provision was, however, made in regard to gas-works. The Gas Committee reported that they had considered the matter, and they recommended that no action be taken against the mine owners whose workings had caused subsidences in the roadways. This was agreed to.

An extraordinary meeting of the Cambuslang Gas Company, Limited, was held on Wednesday last, when a resolution was adopted unanimously to the effect that the capital of the Company be increased from £27,000 to £36,000, by the creation of 9000 shares of £1 each. Mr. David Rankine, J.P., who presided, explained that the increase in the capital of the Company was necessary to meet the capital expenditure in connection with the extension of the gas-works in the immediate future. It was proposed to introduce new sulphate plant, to extend the retort-bench, and to erect public offices in the vicinity of the present gas-works. There was also a new railway which it was proposed to lay down from the Caledonian Railway Company's system into the gas-works. Arrangements for the proposed railway had not yet been completed, either with the Railway Company or the County Council.

CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *Oct.* 15.

Sulphate of Ammonia.

During the past week there has been renewed strength in the market, and a good business has been done at steadily advancing prices. There has again been a considerable amount of purchasing in order to fulfil shipments against old contracts; and this, coupled with the appearance of an appreciable volume of new orders, has had the natural effect of further stimulating the tone. The closing values are £12 17s. 6d. to £12 18s. 9d. per ton f.o.b. Hull, £12 18s. 9d. to £13 per ton f.o.b. Liverpool, and £13 1s. 3d. to £13 2s. 6d. per ton f.o.b. Leith. A fair inquiry has been experienced in the forward position, and sales are reported at £13 per ton f.o.b. Leith for January-April delivery, and at £12 15s. per ton f.o.b. Liverpool for January-December 1911.

Nitrate of Soda.

There is no new feature to comment upon in this article; the spot market being rather idle at 9s. 4½d. per cwt. for ordinary, and 9s. 7½d. for 96 per cent. quality.

LONDON, *Oct.* 17.

Tar Products.

The markets for tar products have been steady throughout the past week, but there has been little of interest doing. Pitch has been quiet. The majority of makers are very easy in their position, and are quite determined to wait before placing any further quantity. One or two,

however, have sold at prices varying from 35s. 6d. to 36s. 6d. per ton f.o.b. east coast. Benzol, 90 per cent., is quiet, and makers are fairly firm in their ideas. But there are few orders except for delivery all over next year; and for this period consumers appear to think that they can get on at a very low figure indeed. Fifty-ninety per cent. benzol is quiet, and the value is unaltered. In toluol, there is not much demand, and makers are very well sold. Solvent naphtha is quiet in London; but there are reports in the North that it is very firm, although it seems to be difficult to get confirmation of this. Heavy naphtha is steady; and business has been done at improving prices for delivery all over next year. Creosote is still very quiet; and makers in the North appear disposed to sell some quantity at any rate at the market price. Business is reported at 1⅞d. to 2d. per gallon at makers' works.

The average values during the week were: Tar, 18s. 3d. to 22s. 3d. *ex* works. Pitch, London, 36s. to 36s. 6d.; east coast, 35s. 6d. to 36s.; west coast, 37s. to 38s. 6d. Clyde ports, 35s. 6d. to 36s. Liverpool, 35s. to 36s. Manchester. Benzol, 90 per cent., casks included, London, 7d. to 7¼d.; North, 7d. to 7¼d.; 50-90 per cent., casks included, London, 7½d. to 7⅝d.; North, 7¼d. to 7½d. Toluol, casks included, London, 9d. to 9⅛d.; North, 9d. Crude naphtha, in bulk, London, 3⅛d. to 4d.; North, 3⅛d. to 3¼d.; solvent naphtha, casks included, London, 1s. to 1s. 0⅛d.; North, 11d. to 1s.; heavy naphtha, casks included, London, 11d. to 11½d.; North, 10¾d. to 11d. Creosote, in bulk, London, 2⅜d. to 2½d.; North, 1⅞d. to 2⅛d. Heavy oils, in bulk, 2⅜d. to 2⅝d. Carbolic acid, 60 per cent., casks included, east coast, 1s. 0½d.; west coast, 1s. Naphthalene, £4 10s. to £8 10s.; salts, 40s., bags included. Anthracene, "A" quality, 1¼d. per unit, packages included and delivered.

Sulphate of Ammonia.

The market is very firm indeed, and prices still continue to advance for near delivery. The principal Gas Companies are asking £12 10s. to £12 11s. 3d. for prompt delivery, and a further increase for forward is reported. In London, the market for outside makes, Gas Companies terms, is about £12 5s. to £12 7s. 6d. In Hull, £13 has been paid; and in Liverpool, £13 1s. 3d. In Leith, £13 2s. 8d. is asked; while in Middlesbrough, £13 is reported to have been paid.

From other sources we learn that the healthy tone in the market for tar products referred to last week continues. The phenol series are greatly in evidence. Creosote is about the same in the North, and slightly better in London. One of the large Gas Companies is sold out in pitch; and it is generally believed that many distillers are well sold in this article. In some parts of the North the supply is not equal to the demand at present. Shipments and deliveries are being made at prices near the following: Tar, 20s. to 26s. 6d. per ton. Pitch, London for export, 41s. per ton; Manchester, 39s. per ton; Liverpool, 40s. per ton; Glasgow, 40s. On the east coast, during the last few weeks, it is reported that a large order has been placed at 40s. per ton. Creosote sells at 2d. to 2¼d. per gallon, according to position of maker's works; bulk oil, 2¾d. firm. Benzol, 50-90 per cent., fetches 7½d. per gallon; casks included; solvent naphtha, 1s. per gallon naked; crude naphtha, 3½d. per gallon naked; light oil, 3⅜d. per gallon naked; carbolic acid, 60's, 1s. 0½d. per gallon; drained salts, 50s. per ton naked.

One with an intimate knowledge of the trade writes: With reference to your correspondent's remarks in last week's "JOURNAL," I take exception to the pitch prices referred to by him—they are so high that they do no good to either buyer or seller. In London, pitch was offered by an important maker at 37s., without finding a buyer; and even the principal Gas Companies are willing to accept 40s. In Manchester, 35s. has been accepted in one instance; while offers have been made at 36s. without resulting in business. In Liverpool, sales have been made at 35s. 6d. to 36s. f.a.s.; and in Glasgow there are sellers at 38s. to 38s. 6d, and one lot has been sold at 37s.

COAL TRADE REPORTS.

Northern Coal Trade.

There has been a rather better demand for coals, and the shipments both of steam and gas coals are better; but the prices do not seem to have moved much. In steam coals, best Northumbrians are from 9s. 9d. to 10s. per ton f.o.b., second-class steams are from 8s. 6d. to 8s. 9d., and steam smalls are from 5s. 6d. to 6s. 6d. Production is fairly full, and the output is better taken up. In the gas coal trade, the increase in the demand continues, and should show itself more rapidly in the next few weeks. The price of Durham gas coal, of the usual classes, varies from 8s. 9d. to 9s. 9d. per ton f.o.b., according to the quality; while for "Wear" specials, up to 10s. 3d. is the current quotation. As to contracts, the most important is that for Stockholm, which has gone in the usual channels, at a price of about 13s. 1½d. per ton, delivered—a price below that of the preceding contracts, which were taken when the values of coal were rising. Other smaller contracts are in treaty; but some of the best gas coal collieries have now a large part of their output bespoken for some months. Coke is steady; but gas coke is more plentiful, and may be quoted at from 13s. 3d. to 13s. 9d. per ton f.o.b.

Scotch Coal Trade.

Trade has been a little more active. Ell is in better request, and splint has been moving off more freely. Colder weather has also enhanced the sale of house coal. On account of the lock-out in the shipyards, the demand for small sorts has been poor. The prices now quoted are: Ell, 8s. 9d. to 10s. per ton f.o.b. Glasgow; splint, 9s. 3d. to 9s. 6d.; and steam, 8s. 9d. to 9s. The shipments for the week amounted to 338,730 tons—a decrease of 6186 tons upon the previous week, but an increase of 3513 tons upon the corresponding week of last year. For the year to date, the total shipments have amounted to 12,476,313 tons—an increase upon the corresponding period of 724,618 tons.

There has never been any apparatus of the same type as—The "GARAJO"

It has never been approached for SIMPLICITY and ECONOMY!

Boiler No.	Approximate Consumption per hour.	No. of "Essex" Radiator Loops which "Garajo" Boiler will heat up.	Amount of space which "Garajo" Boiler and Radiators will, under normal conditions, maintain at a suitable temperature.					
		Double Column, 36 in.	Garages.	Coach-houses and Stores.	Meeting Rooms, Shops and Schools.	Living Rooms, Workrooms, &c.	Entrance Halls, Staircases.	Feet of 4in Pipe.
	Cub. Ft.		Cub. Ft.	Cub. Ft.	Cub. Ft.	Cub. Ft.	Cub. Ft.	
B1604	8	4	1145	1440	1145	900	1145	13⅓
B1606	10	6	1715	2160	1715	1350	1715	20⅓
B1608	12	8	2290	2880	2290	1800	2290	27
B1610	14	10	2860	3600	2860	2250	2860	33⅔
B1612	16	12	3430	4320	3430	2700	3430	40⅓
B1614	18	14	4000	5040	4000	3150	4000	47⅓
B1616	20	16	4575	5760	4575	3600	4575	54
B1618	22	18	5150	6480	5150	4050	5150	60⅔
B1620	24	20	5720	7200	5720	4500	5720	67⅔

In each number the Boiler is the same—and the price is the same. It is the Governor only that varies, each number passing a definite increased amount of gas above that of the preceding number.

JOHN WRIGHT & CO.,
Essex Works,
BIRMINGHAM.

251.

Fair-Contracts Clause at Oldham.

In the course of the business at the last meeting of the Oldham Town Council, Mr. Heywood asked the Chairman of the Gas Committee for information respecting a complaint from the Oldham Trades Council that the Contractors for the erection of the Higginshaw gasholder had not complied with the requirements of the fair-contracts clause. Alderman Thompson, in reply, said it was recorded in the minutes of the previous Council meeting that the Gas Committee had received a deputation from the Oldham Trades and Labour Council, who made allegations that the Contractors for the Higginshaw holder were not complying with the conditions of the fair-contracts clause. Certain charges were made with reference to the wages paid; the Trades Council maintaining that the holders-up for the riveters came under the same heading as the holders-up for riveters at boiler-works. The Contractors were found to have one or two men, for certain reasons, under the standard rate of wages; and they complied with the request to pay all the standard rate. The rate of wages for riveters was 35s. 6d. per week; and one man, who had left the trade for some time, and had come back recently, was paid 32s. for the first fortnight, and afterwards 34s. for a time. Whether they raised the man's wages or discharged him, he could not say. Then they came to the holders-up, where the dispute was really caused. The Contractors maintained that the average wage for these was 6½. per hour, which they paid; but the Trades Council said it should be 31s. 6d. per week. From inquiries made from the Manchester Corporation as to the wages paid on the construction of their gasholder, they thought that the wages for holders-up were 6d. per hour. The Committee gave the Trades Council further opportunity to furnish additional information, because they had only spoken from what they had heard, and not from anything positive. To sum up, as far as the investigations of the Committee had gone, there was no reason to believe that Messrs. R. Dempster and Sons were not adhering to the fair-contracts clause; and they could not see that the Corporation had any cause to interfere with them and their workpeople at the present time.

A Gas Manager's Power and Duties.—Mr. Denham, the Manager of the Ashburton (Devonshire) Gas-Works, wrote to the District Council at their last meeting asking to be informed as to his position, power, and duties, and applying for assistance. Mr. Lamerson said the Gas Committee had referred Mr. Denham to the terms of his appointment, and had told him he would receive assistance at the proper time. Mr. Cock asked if it was not a fact that more gas was being made now than when Mr. Denham was appointed, and said he believed the Manager had a real grievance. Mr. Lamerson remarked that Mr. Denham was simply the Works Manager, and his duty was to make gas and other products for the Council. Mr. Butcher stated that there was talk outside of friction between the Council and their employees; and the whole matter ought to be cleared up. Mr. Lamerson said that no doubt when the work now in progress at the gas-works was completed the question would be gone into by the Committee, and things put straight.

Defalcations by a Gas Company's Clerk.

At the Bournemouth Quarter Sessions last Tuesday, Herbert Buckley, head clerk in the office of the Bournemouth Gas and Water Company, was charged with falsifying the accounts of the Company to the extent of between £1700 and £1800 by omitting from the cash-book various receipts of moneys. The accused, who had been in the Company's service upwards of eighteen years, was charged in respect of about £600 only; and the Directors intimated that they did not wish to press the matter. Prisoner pleaded "Guilty;" and it was explained that the money had been lost on Stock Exchange speculations and transactions with money-lenders. The Recorder, in passing sentence of twelve months' imprisonment in the second division, said he thought the offences of the accused would probably not have been committed if a better system of auditing the accounts had been in existence.

Claim for Gas-Fitting Work.

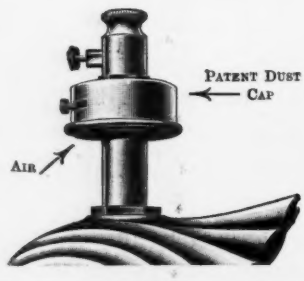
In the Shoreditch County Court, a few days ago, before his Honour Judge Smyly, K.C., Mr. George Snow, of 33, Smalley Road, Stoke Newington, sued Mr. W. G. Hayes, of 7, Mildmay Road, Stoke Newington, to recover £2 10s. for gas-fittings and plumbing work done. The plaintiff proved having carried out certain gas-fitting work by order of the defendant, for which he now declined to pay. Defendant said he did not consider himself called upon to pay anything, as it had cost him more to put the work right than the amount claimed. When the plaintiff had finished, there was a smell of gas all over the house, and he called the plaintiff in again. He professed to do something; but the smell was just as bad directly afterwards. Plaintiff said he had done his work thoroughly, but defendant left a tap turned on, and, of course, there was a bad escape of gas. For the defence, Mr. Leonard, a gas-fitter, said he was called in to stop an escape, and found the work had been executed in so unworkmanlike a manner that it would have to be done over again. Plaintiff had used lead piping which cost 2d. a foot, but had charged for it at the rate of about 6d. Not only was the piping unsuited to the work, but the cost was excessive. He had stopped escapes of gas on numbers of occasions. His Honour referred the account to the Registrar.

Skipton Water Supply.—An application by the Skipton Urban District Council to the Local Government Board for permission to borrow £11,800 in connection with the Embsay Moor water scheme has been the subject of an inquiry by Mr. R. G. Hetherington. There was no opposition; and the inquiry was taken up solely with an examination by the Inspector of the details of expenditure in connection with the scheme. The estimate for the works was £69,000; and this has been exceeded by £8030. Mr. T. Duckett, the Chairman of the Water Committee, assured the Inspector that the Committee had gone thoroughly into all the matters connected with the expenditure.

The BLAND NEW TYPE BURNERS.

The BURNERS "MIXED WITH BRAINS."

"The Gas World."



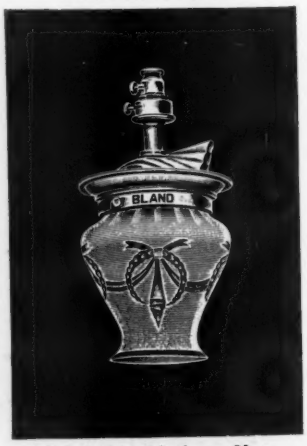
The PATENT DUST CAP effectually prevents Dust Dirt, Fluff, etc,, from entering the Air Chamber.

SELF-INTENSIFYING.

The S.I. No. 1.

A Wonderful Burner, developing **125** Candle-Power.

INTERMEDIATE.



The "B" Medium Size.

65 Candle-Power.
2½ c.f. Consumption.

THE BLAND LIGHT SYNDICATE, LIMITED, LONDON and MANCHESTER.

New Season's Catalogue Now Ready; Post Free.

A Question of Rating.

A local correspondent writes: Municipal electricity undertakings, when they are in competition with company-owned gas-works, can always count upon some advantages. They get the public lighting in the better streets, charging practically what they like for it; and they have also the benefit of any advantage which may accrue from the lighting of buildings under the control of the corporation. Another old practice is to favour electricity works in the matter of assessment to the rates. The Chairman of the Plymouth Electricity Committee, Mr. Anthony, complained at a meeting of the Town Council yesterday week, of the burden put upon the undertaking by what he described as the over-assessment of the works. This complaint was endorsed by Mr. Crowle, a member of the Committee, who argued that, as the property is being developed for the good of the town, it is unfair to handicap it by heavy rates. No one seems to have thought of the Gas Company, whose assessment was recently increased by no less than 50 per cent., and who, if anyone, have certainly the more right to complain of unfairness. A "friendly appeal" to the Assessment Committee to remedy the grievances of the Electricity Committee was suggested by another member of the Council. It will be interesting to watch the developments. The Gas Company's friendly appeal was without result; and though they probably did not ask for special treatment because of what they are doing for the benefit of the town, they could make at least as good a claim on this ground as the Electricity Committee. The advantages of a supply of cheap gas are known and appreciated by all classes in Plymouth; and there is nothing which the Electricity Committee are doing which can compare in advantage to the town with its gas at 1s. 8d. per 1000 cubic feet.

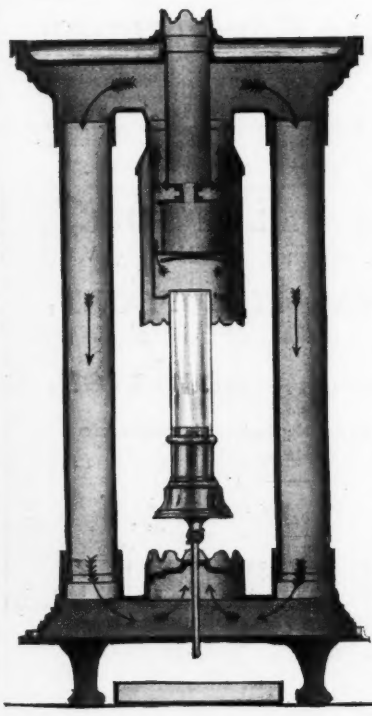
Mersea and District Gas Company, Limited.—In the last number of the "JOURNAL," it was announced that Mr. Alec. E. Whitcher had been appointed Manager of this Company. According to the "East Anglian Times," the undertaking promises to be in every way successful. Our contemporary says: "The rapidly-increasing population of Mersea Island—a pleasant seaside resort—have hitherto, save in the rare instance of a private installation of electricity, had no artificial light except that supplied by mineral oil and candles. But the island, which is 5½ miles long by 2½ miles wide, has developed so rapidly, and is attracting such an excellent class of visitors, that the new Gas Company will undoubtedly, to use a stereotyped phrase, supply a long-felt want. The capital is fixed at £6000, of which it is understood that about £4000 has been already subscribed. The Chairman of Directors is Mr. W. J. Bean, a substantial local landowner; the Secretary being another well-known resident, Mr. Percy Hutchinson. The site for the gas-works has been already selected and surveyed, and the work of erecting the necessary appliances will be proceeded with forthwith. The Contractors for the plant are Messrs. Drakes Limited, of Halifax; while Mr. Thorp, of West Mersea, will erect the buildings. The Company is receiving locally very influential support."

Extended Use of "Coalexld."—In the notice of the recent Smoke Abatement Exhibition in Glasgow which appeared in the "JOURNAL" for the 20th ult., reference was made to the stand of Coalexld Limited, of Lancaster. We learn that, as the result of the exhibit, the Glasgow Corporation have adopted the process, and are now doing a large trade in "Coalexld."

Charge for Water by Rate and Rent.—The Northampton Corporation are contemplating applying to Parliament next session for various powers; and at a recent meeting the Water Committee submitted certain proposals for inclusion in the Bill. Mr. E. Lewis suggested the addition of a clause empowering the Council to charge in two ways for water—by rate and by rent; and he moved that powers be sought for the purposes he had mentioned. He said the present system was very unjust to people who were compelled to have water laid on to their premises, but who, while using very little, had to pay the percentage on the rateable value. In this connection, he instanced solicitors' offices and large business premises, and said that the present system of charging could not be altered unless powers were obtained. Mr. Collier said the Water Committee were selling a commodity at a remunerative price; and those whose premises were so situated that they did not need a supply of water ought not to be called upon to pay. Water used in street flushing and purposes of that kind was paid for in the district rate. Mr. T. D. Lewis remarked that under present arrangements the owners of premises on which only 2s. 6d. worth of water was used might have to pay £2 10s. for it. Property of the rateable value of £26,000 escaped its share of the water undertaking. The motion was carried.

Interruption of Electric Lighting in Paris.—France was thrown into a state of disorganization last week by the strike of a large number of the men engaged upon the principal railway lines; and, in sympathy with them, the electricians in Paris ceased work at seven o'clock on Thursday evening, with the result that some of the main thoroughfares of the city were deprived of the light usually afforded by this illuminant. According to the "Daily Mail," at six o'clock the lights began to grow dim at the Ministry of the Interior, and paraffin lamps had to be hastily procured. Then the electricity failed in the Madeleine quarter, the Champ de Mars, the Trocadéro, the Arc de Triomphe, the Boulevard St. Germain, and in other districts. M. Lépine, the Prefect of Police, engaged a motor-car, and on arriving at the Elysée found the President, M. Fallières, and his Secretary sitting in a room lit by candles. After fifteen minutes the light suddenly reappeared in one or two districts; but at midnight the Elysée Palace, the Ministry of the Interior, the Prefecture of Police, and all the district lying on the southern bank of the Seine, were totally deprived of electricity. All electrically worked clocks, lifts, and most of the suburban tramway lines were at a standstill; many vehicles being left in the middle of the roadway. It appears that the Government had anticipated something of the kind, and had held a certain number of engineers and firemen in reserve. As a result, no further interruption of the supply was likely to occur.

CLARK'S "SYPHON" STOVES.



Section A, showing Condensing Principle.

WORKING PRINCIPLE.

SECTION A.

¶ This diagram shows the passage of the hot gases after leaving the burner. They first strike the central heating chamber directly over the chimney and pass over the shoulders down the tubes at the sides, where they condense into liquid and enter the tray provided for the purpose.

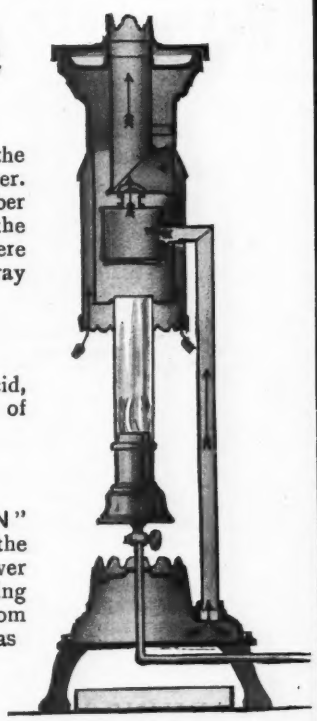
Analysis of Products:—

Sulphurous Acid, Sulphuric Acid, Carbonic Acid, Sulphur, Oxide of Iron, and Water.

SECTION B.

¶ Explains the patented "SYPHON" principle; the arrows indicate the passage of hot air drawn from the lower portion of stove up to the central heating chamber, where it is mixed with air from the room and then finally passed out as

PURE HEAT.



Section B, showing Patent "Syphon" Principle.

Advertisement of CLARK'S SYPHON STOVE CO., LTD., Warrington, and 132, Queen Victoria Street, E.C.

The Lighting of Bideford.—It was announced at the last meeting of the Bideford Town Council that the Gas Company had reduced the cost of public lighting for the ensuing year by 1s. 6d. per lamp. Satisfaction was expressed with a new light which the Company had installed as an experiment; and Mr. Cocks suggested that the money saved on the lighting through the reduction of price should be utilized in fixing these new lights throughout the town. A Committee was appointed to communicate with the Company on the matter, and report as to the cost of installing improved lights.

St. Petersburg Gas Supply.—The members of the St. Petersburg Town Council have made a tour of inspection of the city gas-works, which not long ago were taken out of the hands of a private Company. They are very old, but in a fairly satisfactory condition—indeed, they are now stated to be working better than they did when they were in the Company's hands. A pood of coal (36 lbs.) under municipal management yields 165 cubic feet of gas, whereas before the yield was only 144 cubic feet. The gasholders are working tolerably well. One is considered to be rather dangerous; and, in view of this, a water-pipe has been fitted on the crown to deal with an outbreak of fire if it should occur. With regard to the thorough reconstruction of the works, which is in all respects desirable, it is proposed to transfer the whole establishment to the Gutuieff Island, which it is considered would be advantageous from both the sanitary and the economic point of view. Coal could be delivered there at something like 2 copecks (½d.) per pood less than at the present works.

Gas v. Electric Lighting at Chepstow.—At a recent meeting of the Lydney Rural District Council, a member, who is also a guardian, stated that the electric light at 6d. per unit was equal to Chepstow gas at 3s. 6d. per 1000 cubic feet. This statement brought a reply from Mr. James Robb, the Company's Engineer, Manager, and Secretary, and it appeared in a local paper last Saturday in the form of a letter to the Council. He pointed out that in January last year the Monmouth Guardians inquired at Chepstow as to the relative costs of the two lights, and it appeared that for the year ended September, 1908, the electric light at 6d. a unit had cost £94 8s., compared with the gas for the corresponding period for the old building of £23 12s. 5d. Mr. Robb added that the Gas Company were prepared to prove that the lighting of the same premises with gas with an equally good light would only amount to £35 per annum. He said the Company did not want to prevent anyone supplying electric or any other light, as they were satisfied that gas would hold its own on its merits, as it had done in Westminster and elsewhere. They, however, asked the Council to stipulate that where the electricians came into close proximity to any of the Company's pipes with their columns, wires, &c., they should keep at a sufficient distance, so that the Company might be able to get at them for repairs and making connections thereto. They also asked that where the wires, &c., were embedded in the ground they should be perfectly insulated, as if this was not properly done it destroyed pipes, more especially the water-pipes, besides endangering life, and causing disastrous fires and ground explosions.

APPLICATIONS FOR LETTERS PATENT.

22,666.—Alley, S.E., "Stop-valves." Sept. 30.
22,675.—Schuh, J., "Compressing gases." Sept. 30.
22,678.—Agopian, H., "Artesian wells." Sept. 30.
22,759.—Bruneau, G., "Gas heating apparatus." Oct. 1.
22,760.—Liddle, J., "Time-switch for lighting-circuits." A communication from Rudolf Buderer and Co. Oct. 1.
22,761.—Day, C., and Dexter, W. A., "Rotary pumps or compressors." Oct. 1.
22,794.—Cohn, S., "Mantles." Oct. 1.
22,838.—Richmond Gas Stove and Meter Company, Ltd., and Thornton, H. M., "Gas-fire fittings." Oct. 3.
22,862.—Still, C., "Distilling hydrocarbons dissolved in tar-oils." Oct. 3.
22,891.—Prosser, H. R., "Gas-burners." Oct. 4.
22,892.—Thomas Piggott and Co., Ltd., and Barker, T. P., "Jointing steel pipes, tanks, or the like." Oct. 4.
22,907.—Fabry, R., "Bye-product coke-ovens." Oct. 4.
22,908.—Beilby, H. N., "Distillation of coal." Oct. 4.
22,931.—Ellwood, T. B., "Stop-cocks." Oct. 4.
22,951.—Zechnall, L., "Incandescent burners." Oct. 4.
22,971.—Specht, P., "Inverted gas-lamps." Oct. 4.
23,000.—Barralet, T. E., and Parkinson Stove Company, Ltd., "Combined gas and water taps for geysers." Oct. 5.
23,004.—Seaton, A. I., "Meter cash-box." Oct. 5.
23,008.—Richmond Gas Stove and Meter Company, Ltd., and Sherburn, W. H., "Burner-taps." Oct. 5.
23,022.—Charters, H., "Gas-stoves." Oct. 5.
23,033.—White, W., "Gas-stoves." Oct. 5.
23,036.—Kelley, F. A., Dutchman, E., and Jessop, S., "Gas-burners of the automatic lighting and governing type." Oct. 5.
23,040.—Marken, J. C. van, "Production of gas." Oct. 5.
23,072.—Feeny, V. I., "Gas-cocks." Oct. 5.
23,080.—Verity, J. W., and Lewis, F. C., "Increasing the calorific value of fuel." Partly communicated from E. B. Higgins. Oct. 5.
23,085.—Hatton, E., "Incandescent gas-lamps." Oct. 6.
23,118.—Bernhard, E. E., "Generating acetylene gas." Oct. 6.
23,124.—Summers, W., "Controlling the flow of liquids." Oct. 6.
23,125.—Tanne, J., and Oberlander, G., "Separating solid hydrocarbons from naphtha residues and tars." Oct. 6.
23,137.—Brooks, B. W., "Cocks or valves." Oct. 6.
23,179.—Edgar, W., "Coin or token freed apparatus for supplying gas for a predetermined period." Oct. 6.
23,187.—M'Robbie, W., "Rotary compressors or pumps." Oct. 7.
23,211.—Wilson, W. A., "Gas-tap for duplex burners." Oct. 7.
23,235.—Price, H. S., "Water-meter." Oct. 7.
23,269.—Rossbach-Rousset, F., "Vent-valves for gas lighting apparatus." Oct. 7.
23,290.—Kent-Johnston, A. G., "Lighting and extinguishing gas-lamps." Oct. 8.

PARKINSON FIRES are unsurpassed for HEATING EFFICIENCY & ECONOMY IN GAS CONSUMPTION.

One of our New Patterns,
The "BASIL."
SEE BOOKLET FOR OTHER DESIGNS.

FEATURES IN PARKINSON GAS FIRES WHICH MAKE THEM PRE-EMINENT:—

THE INTENSE PILLAR FUEL,
Unexcelled for rapid Incandescence and Heating Value.

THE PIVOT OVAL FIRE FRONT,
which allows full value in radiation and facilitates fuelling.

IMPROVED GAS-AIR ADJUSTER.

All Wearing Parts strictly interchangeable Size for Size.

May we send you a Sample for Inspection?

THE PARKINSON STOVE CO., LTD.
(Incorporating Maughan's Patent Geyser Co.),
BIRMINGHAM & LONDON.

PARKINSON FIRES are specially suitable for Hiring Purposes.

The New Holder at Burton-upon-Trent.—The new gasholder and tank at Burton-upon-Trent described by Mr. R. S. Ramsden in his Presidential Address to the Midland Junior Gas Association, as reproduced in the "JOURNAL" last week (pp. 127-130), were, we understand, constructed by Messrs. Clayton, Son, and Co., Limited, of Moor End Works, Hunslet, Leeds.

Lighting Refuge Lamps in Westminster.—The Works Committee of the Westminster City Council report that they have been informed that there are 7 gas-lamps on refuges to be dealt with within the area of the new contract with the Gaslight and Coke Company for public lighting. There are also 15 gas-lamps on refuges which do not come within the contract, but which the Company are willing to treat on the same lines. The present annual charge for these lamps is £5 5s. 2d. each. The annual charge, under the contract, for 180-candle lamps is £4 10s. per lamp; the cost of converting existing lanterns is 12s. 6d. each, and the cost of new lanterns £1 5s. each. The Committee have given instructions that the 22 refuge gas-lamps above referred to be converted to 180-candle lamps, and be lighted and maintained under the new contract with the Gas Company.

Clark's Syphon Stove Company, Limited, issue an excellently prepared catalogue of their "pure-heat-giving" syphon and other gas-stoves. The whole of these have been recently revised and brought up to date; and special attention has been given to the construction and materials used, with the object of reducing costs of maintenance to a minimum. Pure heat only is obtained, the Company point out, by means of condensing the products of combustion in a manner scientifically correct. The catalogue is in a stiff cover; and the numerous illustrations include two in colour.

The Directors of the Bombay Gas Company, Limited, have declared an interim dividend of 3 per cent. for the six months ended the 30th of June.

The Directors of the Monte Video Gas Company, Limited, have declared an interim dividend of 6s. per share, less income-tax, for the half year ended the 30th of June.

The Richmond Gas Stove and Meter Company have just received an order to supply a suite of cooking apparatus for one of the largest public institutions in Italy. This will make the twenty-fourth installation of its kind—each capable of dealing with the requirements of 1000 persons. The whole of the installations have been supplied by the "Special Apparatus Department" of the Richmond Gas-Stove Company.

A Local Government Board inquiry regarding the water supply of the district east and south of Rotherham was held last week by Mr. M. K. North. Applications had been made by the Rotherham Rural District Council to borrow £8596 for purposes of water supply for the contributory places of Bramley, Brampton-en-le-Morthen, Hooton Levett, Laughton, Maltby, Ravenfield, Ulley, and Wickersley, including the execution of certain works at Aughton. It was explained that the Council had come to the conclusion that the only sure way of getting at all times a full supply was from the Sheffield Corporation mains at Aston. Mr. William Terrey, the Manager of the Sheffield Water Department, stated that the Corporation undertook by agreement to supply water in bulk at Aston, at the rate of 9d. per 1000 gallons; the minimum quantity being 90,000 gallons a day for the parishes named, and the agreement to be for fifty years. This was part of a large scheme for supplying water over a wide district.

WANTED, FOR SALE, CONTRACT, &c., ADVERTISEMENTS IN THIS WEEK'S "JOURNAL."

Situations Vacant.

ENGINEER AND MANAGER. Stafford Gas and Electricity Department. Applications by Oct. 24.
DRAUGHTSMAN. No. 5302.
CARBONIZING FOREMAN. No. 5303.
FOREMAN BURNER MAINTAINER. Winchester Water and Gas Company.
WASTE WATER AND TAP INSPECTOR. Wombwell Gas and Water Department.

Situations Wanted.

ASSISTANT IN GAS-WORKS. No. 5304.

Plant, &c. (Second-Hand), for Sale.

GAS-WORKS (DISPOSAL OR LEASE), Beaumaris. Particulars of Mr. Cripwell, Birmingham.
RETORT-HOUSE GOVERNOR. No. 5301.
TAR-WORKS. No. 5300.

Patent Licence, &c.

"REGULATING THE TEMPERATURE OF COMBUSTION IN A GAS PRODUCER FURNACE FOR HEATING RETORT OVENS, &c." Page and Rowlingson, New Bridge Street, E.C.

Meetings.

CEARA GAS COMPANY. London Office. Oct. 28. One o'clock.
GAS AND COMMERCIAL SECURITIES CORPORATION. Offices. Oct. 19. 10.30 o'clock.

Stocks and Shares.

BOGNOR GASLIGHT COMPANY (BY AUCTION). Oct. 25.
GRAYS AND TILBURY GAS COMPANY (BY AUCTION). Oct. 25.
LOWESTOFT WATER AND GAS COMPANY (BY AUCTION). Nov. 8.
REDHILL GAS COMPANY (BY TENDER). Nov. 1.
TENDRING HUNDRED WATER COMPANY (BY AUCTION). Oct. 25.

TENDERS FOR

Benzol (Crude).

BRIDGEWATER COLLIERIES COKE-WORKS. Tenders by Oct. 24.

Cyanide Cake.

GLASGOW GAS DEPARTMENT. Tenders by Oct. 25.

Retort Ironwork, &c.

DEVONPORT GAS DEPARTMENT. Tenders by Nov. 5.

Washers.

DEVONPORT GAS DEPARTMENT. Tenders by Nov. 5.

GAS COMPANIES' STOCK AND SHARE LIST.

Referred to on p. 183.

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.				£ s. d.
1,551,868	Stk.	Oct 14	5	Alliance & Dublin Ord.	86–88*	+½	5 13 8
374,000	Stk.	July 14	4	Do. 4 p.c. Deb.	95–98	..	4 1 8
200,000	5	May 12	7	Bombay, Ltd.	6⅞–6¾	..	5 5 8
40,000	5	,,	7	Do. New, £4 paid	5–5¼	..	5 6 8
50,000	10	Aug. 31	15	Bournemouth Gas & Water } 10 p.c.	28½–29½	..	5 1 8
311,810	10	,,	7	Do. B 7 p.c.	16¼–16⅝	+⅛	4 3 7
75,000	10	,,	6	Do. Pref. 6 p.c.	14⅜–15¼	..	3 18 8
380,000	Stk.	Aug. 12	12½	Brentford Consolidated	246–249	..	5 0 5
330,000	,,	,,	9⅜	Do. New	184–186	..	5 2 2
50,000	,,	,,	5	Do. 5 p.c. Pref.	—	..	—
206,250	,,	June 10	4	Do. 4 p.c. Deb.	99–101	..	3 19 3
220,000	Stk.	Aug. 31	11	Brighton & Hove Orig.	215–218	.	5 0 11
246,320	,,	,,	8	Do. A Ord. Stk.	157–160	+2	5 0 0
460,000	20	Sept. 29	10⅝	British	44–45	..	4 12 4
109,000	Stk.	Aug 11	6	Bromley, A 5 p.c.	117–119	..	5 0 10
165,700	,,	,,	4½	Do. B 3½ p.c.	88–90		5 0 0
82,278	,,	,,	5½	Do. C 5 p.c.	107–109	+1	5 0 11
55,000	,,	June 29	3½	Do. 3½ p.c. Deb.	85–87	..	4 0 6
250,000	Stk.	,,	4	Buenos Ayres 4 p.c. Deb.	97–99	..	4 0 10
100,000	10	—	—	Cape Town & Dis., Ltd.	3–4	..	—
100,000	10	—	—	Do. 4½ p.c. Pref.	4¼–5¼	–1	—
50,000	50	May 3	6	Do. 6 p.c. 1st Mort.	50½–51½	..	5 16 6
100,000	Stk.	June 29	4½	Do. 4½ p.c. Deb. Stk.	88–90	..	5 0 0
157,150	Stk.	Aug. 12	5	Chester 5 p.c. Ord.	109½–111½	..	4 9 8
1,513,280	Stk.	,,	5⅜	Commercial 4 p.c. Stk.	105–108	..	4 16 3
560,000	,,	,,	5	Do. 3½ p.c. do.	101–103	..	4 17 1
475,000	,,	June 29	3	Do. 3 p.c. Deb. Stk.	79–81	..	3 14 1
800 000	Stk.	June 10	5	Continental Union, Ltd.	97–99	..	5 1 0
200,000	,,	,,	7	Do. 7 p.c. Pref.	137–139	..	5 0 9
492,270	Stk.	—	5½	Derby Con. Stk.	122–124	..	4 8 9
55,000	,,	—	4	Do. Deb. Stk.	104–105	..	3 16 2
148,995	,,	Oct. 14	5	East Hull 5 p.c. Ord.	103–105*	+½	4 15 3
486,990	10	July 14	12	European, Ltd.	23¾–24¼	..	4 19 0
354,060	10	,,	12	Do. £7 10s. paid.	17¾–18¼	..	4 18 8
16,179,445	Stk.	Aug. 12	4⅜	Gas light and Coke } 4 p.c. Ord.	105¼–106½	–⅜	4 7 7
2,600,000	,,	,,	3½	3½ p.c. max.	87–89	..	3 18 8
4,062,235	,,	,,	4	4 p.c. Con. Pref.	104–106	..	3 15 6
4,531,705	,,	June 29	3	3 p.c. Con. Deb.	80–82	..	3 13 2
258,740	Stk.	Sept 15	5	Hastings & St. L. 3½ p.c.	92–94	..	5 6 5
82,500	,,	,,	6½	Do. do. 5 p.c.	114–116	..	5 12 1
70,000	10	Oct. 14	11	Hongkong & China, Ltd.	17–17⅜*	..	6 5 8
131,000	Stk.	Sept. 15	2⅜	Ilford A and C	145–148	..	4 19 8
65,780	,,	,,	5⅜	Do. B	112–114	..	5 3 1
65,500	,,	June 29	4	Do. 4 p.c. Deb.	98–100	..	4 0 0
4,940,000	Stk.	May 12	9†	Imperial Continental	187–189	..	4 15 3
1,235,000	Stk.	Aug 12	3⅜	Do. 3½ p.c. Deb. Red.	£4–96	..	3 12 11
200,242	Stk.	Aug. 31	6	Lea Bridge Ord. 5 p.c.	120–122	..	4 18 4
561,000	Stk.	,,	10	Liverpool United A.	220–222	..	4 10 1
718,100	,,	,,	7	Do. B	162–164	..	4 5 4
306,083	,,	June 29	4	Do. Deb. Stk.	104–106	..	3 15 6
75,000	5	June 29	6	Malta & Mediterranean.	4⅜–4⅝	+1/16	0 3 1
560,000	100	Oct. 1	5	Met. of } 5 p.c. Deb.	99–101	..	4 19 0
250,000	100	,,	4½	Melbourne } 4½ p.c. Deb.	99–101	..	4 9 1
541,920	20	May 27	3½	Monte Video, Ltd.	12⅝–13	..	5 7 8
1,775,892	Stk.	July 28	4⅜	Newc'tle & G'tesh'd Con.	101¼–102½	..	4 5 4
529,435	Stk.	June 29	3⅜	Do. 3½ p.c. Deb.	90–91	..	3 16 11
55,940	10	Aug. 31	7	North Middlesex 7 p.c.	15¼–14½	..	4 16 7
300,000	Stk.	Apl. 29	8	Oriental, Ltd.	138–140	..	5 14 4
60,000	5	Sept. 15	8	Ottoman, Ltd.	6–6½	..	6 8 0
31,800	53	Aug. 31	13	Portsea Island A.	131–133	..	5 3 0
60,000	50	,,	13	Do. B.	124–126	..	5 3 2
100,000	50	,,	12	Do. C.	117–119	..	5 0 10
114,800	50	,,	10	Do. D and E.	102–104	+3	4 16 2
398,490	5	Apl. 29	7	Primitiva Ord.	7⅞–7⅝	+⅛	4 11 10
796,980	5	June 29	5	Do. 5 p.c. Pref.	5¼ 5⅜	+⅛	4 10 11
488,903	100	June 1	4	Do. 4 p.c. Deb.	97–99	..	4 0 10
312,650	Stk.	June 29	4	River Plate 4 p.c. Deb.	97–99	..	4 0 10
250,000	10	Sept 29	9	San Paulo, Ltd.	15⅛–15⅝	..	5 14 3
62,500	10	,,	6	Do. 6 p.c. Pref.	11¼–11¾	..	5 2 2
125,000	50	July 1	5	Do. 5 p.c. Deb.	51–52	..	4 16 2
135,000	Stk.	Aug. 31	10	Sheffield A	229–231	..	4 6 7
209,984	,,	,,	10	Do. B	229–231	..	4 6 7
523,500	,,	,,	10	Do. C	229–231	..	4 6 7
70,000	10	Oct. 14	6	South African	10⅝–11¼*	..	5 6 8
6,429,895	Stk.	Aug. 12	5/9/4	South Met., 4 p.c. Ord.	121–123	..	4 8 10
1,895,445	,,	July 14	3	Do. 3 p.c. Deb.	80–82	..	3 13 2
209,820	Stk.	Aug. 31	8	South Shields Con. Stk.	155–157	..	5 1 11
605,000	Stk.	Aug. 12	5⅜	S'th Suburb'n Ord. 5 p.c.	120–122	..	4 12 9
60,000	,,	,,	5	Do. 5 p.c. Pref.	120–122	..	4 2 0
117,058	,,	July 14	5	Do. 5 p.c. Deb. Stk.	121–123	..	4 1 4
502,310	Stk.	May 12	5	Southampton Ord.	110–112	..	4 9 3
120,000	Stk.	Aug. 12	7	Tottenham } A 5 p.c.	141–143	..	4 17 11
483,940	,,	,,	5⅜	and } B 3½ p.c.	112–114	..	4 16 6
149,470	,,	June 29	4	Edmonton } 4 p.c. Deb.	57–59	..	4 0 10
182,380	10	June 10	8	Tuscan, Ltd.	9–9½	..	8 8 6
149,900	10	July 1	5	Do. 5 p.c. Deb. Red.	98–100	..	5 0 0
236,476	Stk.	Aug. 31	5	Tynemouth, 5 p.c. max.	112–114	..	4 7 9
255,636	Stk.	Aug. 31	6⅝	Wands- } B 3½ p.c.	139–141	..	4 15 9
85,766	,,	June 29	3	worth } 3p.c. Deb. Stk.	73–75	..	4 0 0

Prices marked * are "Ex div." † Next dividend will be at this rate.

NOTICES TO CORRESPONDENTS, ADVERTISERS, AND SUBSCRIBERS.

No notice can be taken of anonymous communications. Whatever is intended for insertion in the "JOURNAL" must be authenticated by the name and address of the writer; not necessarily for publication, but as a proof of good faith.

COPY FOR ADVERTISEMENTS for the "JOURNAL" should be received at the Office NOT LATER than TWELVE O'CLOCK NOON ON MONDAY, to ensure insertion in the following day's issue.

Orders for Alterations in, or stoppages of, PERMANENT ADVERTISEMENTS should be received by the FIRST POST on SATURDAY.

Wanted, For Sale, and Tender Advertisements, Six Lines and under, 3s.; each additional Line, 6d.

TERMS OF SUBSCRIPTION to the "JOURNAL."
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"VOLCANIC" FIRE CEMENT.
Resists 4500° Fahr. Best for GAS-WORKS.
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a speciality.

FIDDES-ALDRIDGE
SIMULTANEOUS Discharging-Charger.
The one Machine which Discharges and Charges at One Stroke.
See Advertisement, Oct. 4, p. IV. of Centre.
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Telegrams: "DACOLIGHT LONDON." Telephone: 2336 HOLBORN.

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THE very best Patent Grids for Holding
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See Illustrated Advertisement, Aug. 23, p. 548.

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PREPARED from Pure Iron.
Twice as Rich as Bog Ore.
Gives no back Pressure.
The Cheapest in the Market.
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GAS ENGINEERS, RETORT BUILDERS, CONTRACTORS, &c.
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BROTHERTON AND CO., LTD., Ammonia Distillers. Works: BIRMINGHAM, GLASGOW, LEEDS, LIVERPOOL, SUNDERLAND, AND WAKEFIELD.

J. E. C. LORD, Ship Canal Tar Works, Weaste, Manchester. Pitch, Creosote, Benzols, Toluol, Naphtha, Pyridine, all kinds of Cresylic Acid, Carbolic Acid, Sulphate of Ammonia, &c.

AMMONIA Waste Liquor Disposal.
Purification Plant.
Results Guaranteed. No Working Costs.
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SULPHURIC ACID—Special Ly prepared for Sulphate of AMMONIA and BENZOL Recovery Plants. JOHN NICHOLSON & SONS, LTD., Hunslet Chemical Works, LEEDS. Tele.: "NICHOLSON, LEEDS." Telephone: (Two lines), Nos. 2420 and 2421.

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J. W. & C. J. PHILLIPS, 28, COLLEGE HILL, LONDON, E.C., and 25, BRIDGE END, LEEDS.

AMMONIACAL Liquor wanted.
CHANCE AND HUNT, LTD., Chemical Manufacturers, OLDBURY, WORCS.
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SULPHURIC ACID for Sale, specially suitable for making Sulphate of Ammonia.
BROTHERTON AND CO., LTD., Chemical Manufacturers, Works: BIRMINGHAM, LEEDS, SUNDERLAND, and WAKEFIELD.

OXIDE OF IRON.
(NATURAL.)
SPENT OXIDE PURCHASED.
BALE'S FIRE CEMENT.
PAINT FOR GAS-WORKS.
BALE & CHURCH,
5, CROOKED LANE, LONDON, E.C.

SULPHURIC ACID.
SPECIALLY prepared for the Manufacture of SULPHATE OF AMMONIA.
SPENCER CHAPMAN & MESSEL LTD.
with which is amalgamated WM. PEARCE & SONS, LTD.
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See Advertisement on First White Page.
FRIEDRICH LUX, LUDWIGSHAFEN-AM-RHEIN.

READ HOLLIDAY AND SONS, LTD.
HUDDERSFIELD,
Are prepared to Supply
BENZOL, TOLUOLE, NAPHTHA, AND CREOSOTE
in large Quantities.
ENQUIRIES SOLICITED.

CALCIDUM, a Limpid, Colourless, Neutral Liquid; does not affect Metals, freezes only at -67° F., and, therefore, when mixed with Water in Gas Meters, Engines, Generators, &c., prevents these Freezing in the most severe weather. It is also the best means of thawing everywhere, for Extinguishing Fires, and for working Mortar and Cement in Winter. Used regularly for Eight Years by one English Gas Company.
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GAS PLANT for Sale—We can always offer NEW and SECOND-HAND GAS APPARATUS, including Retorts and Fittings, Condensers, Exhausters, Scrubbers, Washers, Purifiers, Gasholders, Tanks, Valves, Connections, &c. Also a few COMPLETE WORKS. Compare Prices and Particulars before ordering elsewhere.
FIRTH BLAKELEY, SONS, AND COMPANY, LIMITED, Thornhill, DEWSBURY.

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It is also used for the enrichment of Gas.
Manufactured and supplied by C. BOURNE, West Moor Chemical Works, KILLINGWORTH, or through his Agent, F. J. NICOL, Pilgrim House, NEWCASTLE-ON-TYNE.
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Telephone: Central Manchester, 7002.
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Apply, THOMAS HORROCKS,
Albert Chemical Works, BRADFORD, MANCHESTER.
Pitch, Creosote, Brick and Fuel Oils, Benzol, Solvent Naphtha, Carbolic, Sulphate of Ammonia.

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Consumers in any form are invited to correspond with Chance and Hunt, Ltd., Chemical Manufacturers, Oldbury, Worcs.

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SPECIALLY prepared for Sulphate of AMMONIA Makers by
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The Reliance Lubricating Oil Company, 19 & 20, Water Lane, Tower St., London, E.C. Agents wanted.

COAL TAR wanted,
Brotherton and Co., Ltd., Tar Distillers,
Works: Birmingham, Glasgow, Leeds, Liverpool, Sunderland, and Wakefield.

CITY and Guilds—Courses in Gas Engineering and Supply (over 100 Passes and 6 Medals in Two Years), Structural Engineering and Heating and Ventilating (two new subjects) for the 1911 Examinations.
Correspondence College Company, Dept. W. 26, Green Street, Cambridge.

£5 REWARD will be paid to anyone Securing for a Young Engineer (Age 18) a suitable Permanent Position as ASSISTANT IN GAS-WORKS. Three Years' training at Gas Contractors' Works. Good Secondary and Technical Education.
Address No. 5304, care of Mr. King, 11, Bolt Court, Fleet Street, E.C.

DRAUGHTSMAN, accustomed to Gas Plant, wanted for the London Office of a Firm of Gas Engineers and Contractors.
Apply, by letter, to No. 5302, care of Mr. King, 11, Bolt Court, Fleet Street, E.C.

BOROUGH OF STAFFORD.
(Gas and Electricity Department.)

THE Corporation of Stafford invite APPLICATIONS for the Appointment of ENGINEER and MANAGER to take Entire Charge of the Gas Department and Supervise the Electricity Department.
Applicants must possess a thorough knowledge of Gas Engineering, and be capable of Designing, Superintending, and Carrying Out any Extensions or Alterations that may be required at the Gas-Works, and undertake the General Supervision of the Electricity Department.
Salary to commence at £350 per Annum, rising (subject to satisfactory services) by annual increments of £25 to £500 per Annum.
Candidate's age to be between 28 and 45.
Applications, stating Age, Training, and Experience (with *Copies* of not more than Three recent Testimonials), to be sent to me on or before Monday, the 24th of October instant.
Canvassing in any way whatever will be a disqualification.

Richd. Battle,
Town Clerk.

Borough Hall, Stafford,
Oct. 4, 1910.

WANTED, a Carbonizing Foreman, used to Regenerators, Retort-House Plant, Stoking Machinery, &c.
Applications, by letter, with full Particulars of Experience, Age, &c., to No. 5303, care of Mr. King, 11, Bolt Court, Fleet Street, E.C.

WANTED, at once, a Smart, Active Cyclist, of Good Appearance, as Uniformed WORKING FOREMAN BURNER MAINTAINER. Wages 27s. 6d. per Week.
Apply, with *copies* of Three recent Testimonials, to the Water and Gas Company, 19, Staple Garden, Winchester.

WANTED, at once, an Experienced Man as WASTE WATER and TAP INSPECTOR. Wages, 32s. per Week. Must have had Experience in Reduction of Waste by the Deacon Waste-Meter System, Meter Reading, &c.
Apply, in own Hand Writing, giving Three References (not Testimonials), to P. D. Walmsley, B.Sc., Gas and Water Engineer, Wombwell, Yorks.

***RE* THE BEAUMARIS GAS-WORKS, BEAUMARIS.**

THE Trustee of the above Estate will be pleased to receive OFFERS for the above BUSINESS, together with the PURCHASE OF PLANT, &c.
The Works and fixed Plant may be had upon Lease. Full Description and Particulars, including turn-over, &c., on Application to Mr. Albert Cripwell, Accountant and Auditor, 12, Cherry Street, Birmingham.

FOR SALE—A Well Situated, Old Established, TAR WORKS. Good Contracts. Satisfactory reasons for Selling.
Address No. 5300, care of Mr. King, 11, Bolt Court, Fleet Street, E.C.

FOR SALE—An 8-inch Retort-House GOVERNOR. Condition equal to new. Has been replaced by a larger Governor.
Address No. 5301, care of Mr. King, 11, Bolt Court, Fleet Street, E.C.

FOR SALE—Complete Gas-Making PLANT, including New Gasholder and Steel Tank, 10,000 Cubic Feet capacity, ready for delivery, with Condensers, Scrubber, Purifiers, &c. Erected complete in England for £1200. Detailed Plan and Specification submitted.
TWO PURIFIERS, 12 ft. by 8 ft. by 5 ft. deep. Three Purifiers 5 ft. 6 in. square, complete with Four-Way Valves and Connections. Re-Erected cheap for immediate Sale.
GASHOLDERS, 16 ft., 24 ft., 26 ft., 30 ft., 42 ft., and 45 ft. diameter. Also 70,000 and 200,000 Cubic Feet capacity Gasholders. Cheap for immediate Sale. Re-Erected in either brick or new Steel Tanks. Full Particulars and Quotation submitted.
STORAGE TANK, 18 ft. long, 13 ft. 6 in. wide, 6 ft. deep, of ⅜-inch thick Boiler Plate. Also CAST-IRON TANKS. Inquiries Solicited.
Firth Blakeley, Sons, and Company, Limited, Thornhill, Dewsbury.

COUNTY BOROUGH OF DEVONPORT.
(Gas Department.)

TENDERS are invited for the carrying out of the following work:—
1—The Supply and Erection of new IRONWORK for Twelve Benches of Through RETORTS.
2—The Supply and Erection of Two ROTARY WASHERS and One LIVESEY WASHER.
Full Particulars may be obtained from the undersigned.
Tenders, endorsed "Tender No. 1" or "No. 2," to be sent, addressed to the Town Clerk, Devonport, on or before the 5th of November, 1910.

W. P. Tervet,
Engineer and Manager.

Gas-Works, Devonport,
Oct. 3, 1910.

BRIDGEWATER COLLIERIES COKE WORKS.
(The Earl of Ellesmere.)

TENDERS are invited for a quantity of from 8000 to 12,000 Gallons per month of CRUDE BENZOL, testing 80 per cent. at 120° C., during the next Six Months, delivered into Contractor's Tanks at the Bridgewater Collieries Wharton Hall Siding (Pendleton and Hindley Branch of the Lancashire and Yorkshire Railway) or at the Brackley Siding (Little Hulton Mineral Branch of the London and North Western Railway).
Tenders, endorsed "Tender for Crude Benzol," to be received at The Bridgewater Coal Offices, 4, Chapel Walks, Manchester, not later than the 24th inst.
Manchester, Oct. 11, 1910.

CORPORATION OF GLASGOW.
(Gas Department.)

CYANIDE CAKE FOR SALE AT THE GAS-WORKS.

THE Corporation are prepared to re- ceive TENDERS for the Purchase of the CRUDE FERRO-CYANIDE of SODA CAKE produced at their Provan and Dawsholm Gas-Works, during the Three or Five Years from and after the 1st of December, 1910.
Forms of Tender and Particulars regarding Conditions of Sale may be obtained on Application to Mr. Alexander Wilson, Gas Engineer, 45, John Street, Glasgow.
Sealed Tenders, marked outside "Tender for Cyanide—Gas Department," must be lodged with the Subscriber on or before Tuesday, the 25th of October, 1910.
The highest or any Tender may not be accepted.

A. W. Myles,
Town Clerk.

City Chambers, Glasgow,
Oct. 14, 1910.

TO MAKERS OF GAS PRODUCER FURNACES.
THE Proprietors of the Patent No. 19,716, of 1905, for "Improvements in Processes of Regulating the Temperature of Combustion in a Gas Producer Furnace for Heating Retort Ovens or for Other Uses," desire to enter into Negotiations with one or more Firms in Great Britain either for the SALE OF these PATENT RIGHTS, or for the Grant of LICENSES to Manufacture under Royalty. For further Information, address,
Page and Rowlingson, 28, New Bridge St., London, E.C.

SALES BY AUCTION OF GAS AND WATER STOCKS AND SHARES.

MESSRS. A. & W. RICHARDS beg to notify that their SALES BY AUCTION of NEW CAPITAL ISSUED UNDER PARLIAMENTARY POWERS, and of STOCKS and SHARES belonging to EXECUTORS and other PRIVATE OWNERS in LONDON, SUBURBAN, and PROVINCIAL GAS and WATER COMPANIES, take place PERIODICALLY at the Mart, TOKENHOUSE YARD, E.C.
Terms for Issuing New Capital, and also for including other Gas and Water Stocks and Shares in these Periodical Sales, will be forwarded on Application to Messrs. A. & W. Richards, at 18, Finsbury Circus, E.C.

By order of the Directors of the
TENDRING HUNDRED WATER-WORKS COMPANY.

(Supplying Harwich, Parkeston, Dovercourt, Walton-on-Naze, Frinton-on-Sea, and adjacent places.)
NEW ISSUE OF 351 £10 "B" SHARES.

MESSRS. A. & W. RICHARDS will SELL THE ABOVE BY AUCTION, at the Mart, E.C., on Tuesday, Oct. 25, at Two o'clock, in Lots.
Particulars of the Auctioneers, 18, Finsbury Circus, E.C.

By order of the Directors of the
GRAYS AND TILBURY GAS COMPANY.

NEW ISSUE OF 400 £10 "B" SHARES.

MESSRS. A. & W. RICHARDS will SELL THE ABOVE BY AUCTION, at the Mart, E.C., on Tuesday, Oct. 25, at Two o'clock, in Lots.
Particulars of the Auctioneers, 18, Finsbury Circus, E.C.

By order of the Directors of the
BOGNOR GASLIGHT AND COKE COMPANY.

NEW ISSUE OF £4000 ADDITIONAL ORDINARY CONSOLIDATED STOCK "A"
AND
£2000 FOUR-AND-A-HALF PER CENT. PERPETUAL DEBENTURE STOCK.

MESSRS. A. & W. RICHARDS will SELL THE ABOVE BY AUCTION, at the Mart, E.C., on Tuesday, Oct. 25, at Two o'clock, in Lots.
Particulars of the Auctioneers, 18, Finsbury Circus, E.C.

By order of the Directors of the
LOWESTOFT WATER AND GAS COMPANY.

NEW ISSUE OF 400 ADDITIONAL ORDINARY £10 SHARES,
AND
£1000 FOUR PER CENT. PERPETUAL DEBENTURE STOCK.

MESSRS. A. & W. RICHARDS will SELL THE ABOVE BY AUCTION, at the Mart, E.C., on Tuesday, Nov. 8, at Two o'clock, in Lots.
Particulars of the Auctioneers, 18, Finsbury Circus, E.C.

THE REDHILL GAS COMPANY.

SALE OF ORDINARY "B" STOCK.

NOTICE is Hereby Given, that it is the intention of the said Company to SELL BY TENDER £5000 of ORDINARY "B" STOCK of and in the Redhill Gas Company. The last day for the reception of Tenders will be Tuesday, the 1st of November, 1910, at Twelve o'clock at Noon.
Forms of Tender, with Particulars of Sale and Conditions of Tender attached, can be had upon Application at the Company's Office, Brighton Road, Redhill.

By order of the Directors,
Horace Long,
Secretary.

Redhill, Surrey,
Sept. 30, 1910.

CEARA GAS COMPANY, LIMITED.

NOTICE is Hereby Given, that the ORDINARY ANNUAL GENERAL MEETING of the Shareholders will be held at the Offices of the Company, 9, Queen Street Place, Cannon Street, in the City of London, on Friday, the 28th day of October, 1910, at One o'clock in the Afternoon, to receive the Report of the Directors; to declare a Dividend; to elect Directors and an Auditor; and for General Purposes.
The TRANSFER BOOKS WILL BE CLOSED from the 15th of October to the 28th of October, both days inclusive.

By order of the Board,
George R. Guyatt,
Secretary.

Oct. 14, 1910.
Dividend Warrants will be sent out on Nov. 5.

GAS AND COMMERCIAL SECURITIES CORPORATION, LIMITED.

NOTICE is Hereby Given, that the FIRST ORDINARY GENERAL MEETING of the Shareholders of the above Company will be held at the Offices of the Company, 39, Lombard Street, London, E.C., on Wednesday, the 19th day of October, 1910, at 10.30 o'clock a.m., and for the following purposes, viz.:

1. To receive and consider the Directors' Report and Statement of Accounts.
2. To sanction the declaration of a Final Dividend.
3. To elect a Director.
4. To elect Auditors and to fix the amount of their Remuneration.
5. To transact any other Ordinary Business of the Company.

The TRANSFER BOOKS OF THE COMPANY WILL BE CLOSED from the 12th of October to the 26th of October, both days inclusive.

Dated this 11th day of October, 1910.

By order of the Board,
L. MAYNARD BROWN,
Secretary.

39, Lombard Street,
London, E.C.

TROTTER, HAINES, & CORBETT,
BRETTELL'S ESTATE, LIMITED,
FIRE-CLAY & BRICK WORKS,
STOURBRIDGE.

Manufacturers of GAS RETORTS, GLASSHOUSE FURNACE & BLAST-FURNACE BRICKS, LUMPS, TILES, and every description of FIRE-BRICKS.

Special Lumps, Tiles, and Bricks for Regenerative and Furnace Work.

SHIPMENTS PROMPTLY AND CAREFULLY EXECUTED.

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THOMAS DUXBURY & CO.,
16, DEANSGATE, MANCHESTER,
Best Gas Coal and Cannel, giving High Illuminating Power, Large Yield per ton, and reasonable in Price.
Telegrams: "DARWINIAN, MANCHESTER."
Telephone 1808.

MIRFIELD GAS COAL.
UNEQUALLED.
Sperm Value 878·85 lbs. per Ton.
Please apply for Price, Analysis, and Report, to the
MIRFIELD COLLIERY COMPANY,
RAVENSTHORPE, NEAR DEWSBURY.
LONDON: 16, Park Village East, N.W.

HEATHCOTE GAS COAL
from the
GRASSMOOR COLLIERIES,
CHESTERFIELD.
Rich in Illuminating Power and Yield of Gas.
Above the Average in Weight and Quality of Coke.
Maintains a High Standard in Residuals.

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VOLUME I. FOURTH EDITION. Price 7s. 6d. net.
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THE CHEMISTRY OF
GAS MANUFACTURE:
A Hand-Book on the Production, Purification, and Testing of Illuminating Gas, and the Assay of the Bye-Products of Gas Manufacture.
By W. J. ATKINSON BUTTERFIELD, M.A., F.I.C., F.C.S.
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By F. H. LEEDS, F.I.C., F.C.S., and W. J. ATKINSON BUTTERFIELD, M.A., F.I.C., F.C.S.
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LONDON: CHARLES GRIFFIN & CO., LIMITED, EXETER STREET, STRAND.

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PHŒNIX SACK HOLDER
Made by
RICHARD SIMON & SONS, LTD., NOTTINGHAM,
One Man can fill a Sack quicker than Two Men without it.
UNBREAKABLE. PORTABLE.
Price 25s.

'BUFFALO' INJECTOR
Operated Entirely by One Handle.
Class A lifts 24 ft.
Class B lifts 12 ft.

SEND FOR LIST.
Telegrams: "Temperature London." Tel. No. 12,455 Central.
GREEN & BOULDING, LIMITED,
28, New Bridge St., LONDON, E.C.

JOHN HALL & CO. OF STOURBRIDGE,
LIMITED,
STOURBRIDGE,
Manufacturers of
FIRE-BRICKS, LUMPS, TILES,
GAS RETORTS,
And every description of Fire-Clay Goods.
RETORTS CAREFULLY PACKED FOR SHIPMENT.

COOKE, ENNEVER & TULK,
Stock Brokers,
17 & 18, NEWGATE STREET, E.C., and PRINCE'S CHAMBERS, BIRMINGHAM.
We are Buyers and Sellers by Private Treaty of Stocks, Shares, and Debentures in approved Old Established Water or Gas Undertakings, and make this a speciality. Prices quoted on Application.
New Capital issued, Municipal Loans arranged.
COOKE, ENNEVER & TULK,
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NEWBATTLE CANNEL.
Highest Results in Gas, & Excellent Coke.
QUOTATIONS ON APPLICATION TO
THE LOTHIAN COAL COMPANY,
LIMITED,
NEWBATTLE COLLIERIES,
NEWTONGRANGE, MIDLOTHIAN.

JAMES OAKES & CO.,
ALFRETON IRON-WORKS, DERBYSHIRE,
AND
Wenlock Iron Wharf, 21 & 22, Wharf Road, CITY ROAD, LONDON, N.
Manufacture and keep in Stock at their Works (also large Stock in London)
PIPES and CONNECTIONS, 1½ to 48 inches in diameter, and make and erect to order RETORTS, PURIFIERS, and TANKS, with or without planed joints, COLUMNS, GIRDERS, SPECIAL CASTINGS, &c., required by Gas, Water, Railway, Telegraph, Chemical, Colliery, and other Companies.
NOTE.—Makers of HORSLEY SYPHONS. These are cast in one piece, without Chaplets; doing away with Bolts, Nuts, and Covers, and rendering Leakage impossible.

THOMAS TURTON AND SONS, LIMITED.
SHEAF WORKS, SHEFFIELD,
MANUFACTURERS OF
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FOR ENGINEERS.
STEEL OF ALL DESCRIPTIONS.
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Is sent out in Skeins all ready for use.
Every Skein of equal weight and length.
The Lead Wool Joint is built up evenly all the way through.
Lead Wool requires no melting and can be used in water without risk.
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For Steam, Gas, Water, or Air Blast.

In Hundreds of Ranges
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EXHAUST.
ENGLISH MADE.
"PRECISION" ACCURACY.
INCORRODIBLE.
ALEX. WRIGHT & CO., LTD., WESTMINSTER.

GRAETZIN LIGHT.

MOST IMPORTANT!

Latest Development:

600 C.P. LOW PRESSURE LAMP.

1000 C.P. LOW PRESSURE LAMP.

GAS REGULATION on the TOP of the LAMP.

All Goods are unapproachable for economy and durability.

Ask Wholesalers for Catalogue and Prices.

THE GLENBOIG UNION FIRE-CLAY CO., LTD.

GLENBOIG FIRE-BRICKS AND GAS-RETORTS.

Every Genuine Glenboig Brick, Block, Gas-Retort, &c., is legibly stamped with one or other of the Glenboig Company's Registered Trade Marks, as here shown.

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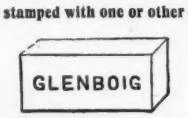

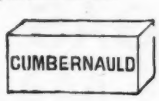

The Glenboig Trade Marks are imitated, and the Glenboig Name unfairly used by Makers of a lower Class of Goods, which, when sold under their own name, command much lower prices.
The Genuine Brand, Stamped on the Goods, is the only Reliable Guarantee to the Purchaser.

GAS-RETORTS, FIRE-BRICKS, BLOCKS, &c., &c.

The SPECIAL BRICKS used in the Construction of Gas Furnaces for Heating Retorts.

Works: GLENBOIG, LANARKSHIRE.
Offices: 48, West Regent St., Glasgow.

57 Prize Medals and Diplomas of Honour.
Highest Award wherever exhibited.

The GLENBOIG BRICKS, BLOCKS, AND RETORTS combine, in the highest degree, the qualities of not melting, and not splitting, when subjected to the highest heats and most sudden changes of temperature, and are, in consequence, found to be economical, even in districts where the local bricks can be had at half the price.

Undernoted we give a Table of Analysis and Physical Characteristics of a sample of Glenboig Fire-Clay by J. T. Norman, London; and, in submitting a report from a responsible and reliable public analyst, we would here draw attention to the unreliable character of some recently published analyses where a manufacturer selects not only his own samples, but also those of his competitor, and has them treated by a private analyst. SUCH STATEMENTS ARE ALTOGETHER UNTRUSTWORTHY.

ANALYSIS OF GLENBOIG FIRE-CLAY.

By JOHN T. NORMAN, Esq., F.C.S., &c., The City Central Laboratory, LONDON.

THE GLENBOIG UNION FIRE-CLAY CO., LTD., GLENBOIG, SCOTLAND.

23, Leadenhall Street,
London, E.C., September 21st, 1909.

Dear Sirs,

I have completed the investigation of the samples of Clay received from you on the 10th inst., and now beg to report the results.

CHEMICAL ANALYSIS.

	Raw.	Fired.
Silica, free	3·03	3·49
Silica, combined	43·20	49·77
Alumina	36·55	42·10
Ferric oxide	1·80	2·08
Titanic oxide	1·30	1·50
Lime	trace	trace
Magnesia	trace	trace
Alkaline oxides	trace	trace
Sulphates as trioxides	0·92	1·06
Loss on Ignition	13·20	—
	100·00	100·00

PHYSICAL RESULTS.

Density	2·65
Volume weight	1·90
Porosity	15·4 %
Linear shrinkage at 100° C.	3·70%
" " " 1050° C.	4·76%
" " Total	8·46%
Volume shrinkage at 100° C.	10·7 %
" " " 1050° C.	12·6 %
" " Total	23·3 %
Plasticity	20·0 %
Fire Stability	1850° C. equiv. 3362° F. (SEGER CONE 36.) (New Scale CONE 38.)

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Inverted Arc Lamp, Fig. 623.

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(Patent) Inverted System

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Height over all.

1-light . . .	1 ft. 8 ins.
2-light . . .	2 ft. 4 ins.
3-light . . .	2 ft. 4 ins.
4-light . . .	2 ft. 7 ins.

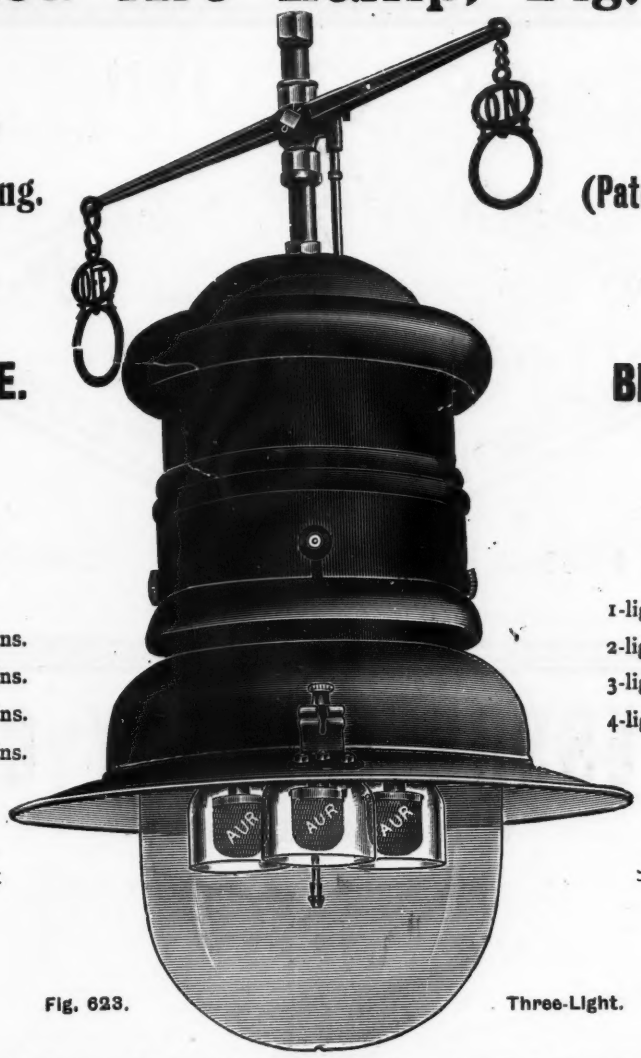

Fig. 623. Three-Light.

Width over all.

1-light . . .	1 ft. 1 in.
2-light . . .	1 ft. 5 ins.
3-light . . .	1 ft. 5 ins.
4-light . . .	1 ft. 8 ins.

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2-light	8 feet	260	**47/6**	**6/-** extra.	4-light	16 feet	550	**72/6**	**9/-** extra.

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	1-Light.	*2-Light.*	*3-Light.*	*4-Light.*
Clear Glass Globes, each	**2/3**	**5/9**	**5/9**	**9/-**
" " " In Case lots per dozen.	**19/6**	**57/9**	**57/9**	**93/-**
Case contains . .	*80*	*18*	*18*	*12*

	1-Light.	*2-Light.*	*3-Light.*	*4-Light.*
Wired Globes, extra each	**2/-**	**2/-**	**2/9**	**3/6**
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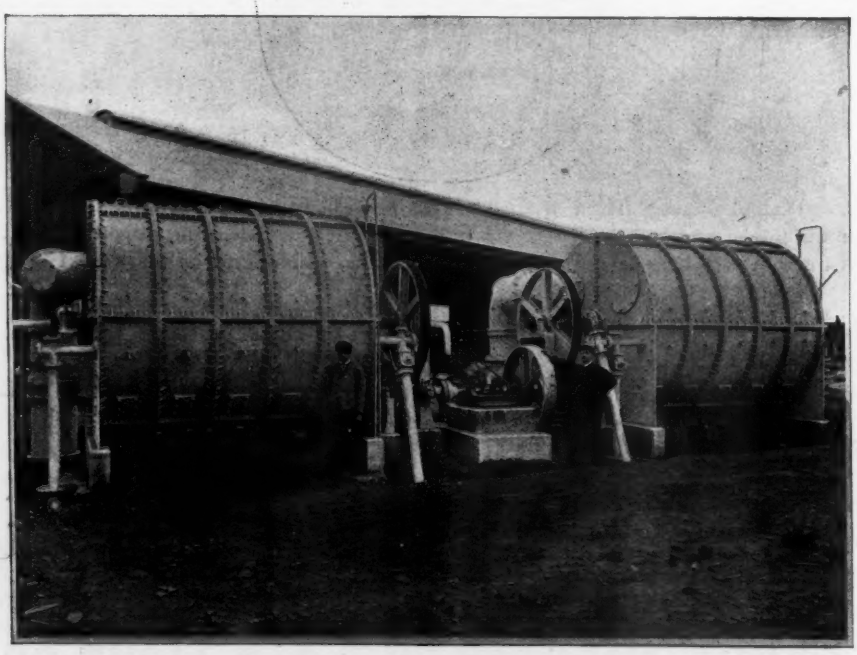

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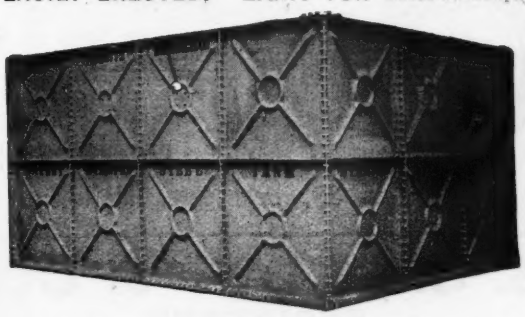

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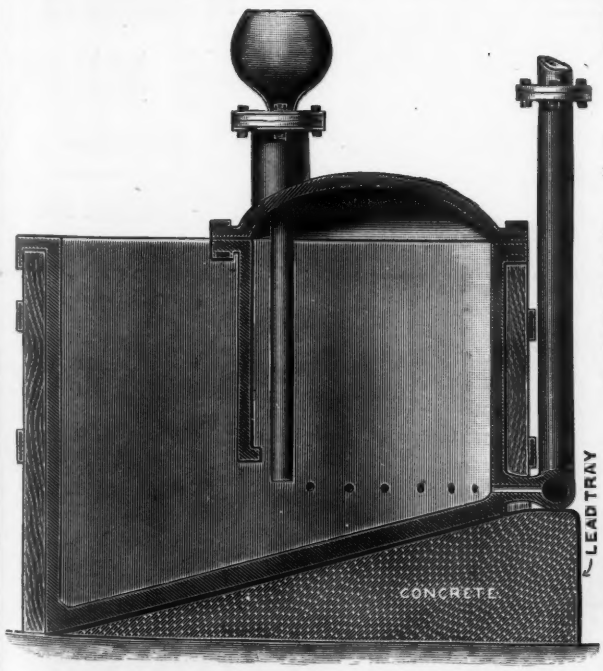

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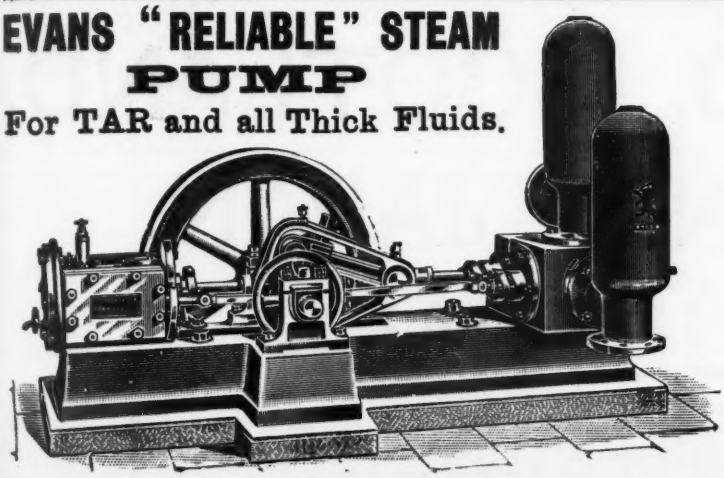

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